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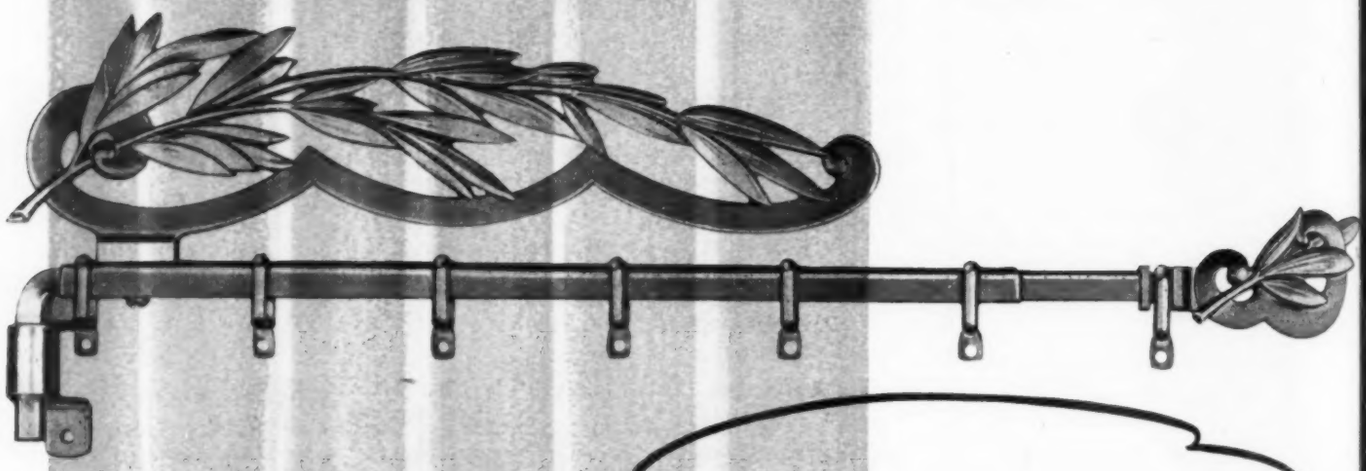
MINIMIZED BY THE LEA METHOD OF FINISHING



Drapery Cranes
BY
JUDD

Here's an excellent example of the effectiveness of the Lea Method of Finishing where articles are highly ornamented. The Lea Method is the clean method, thus eliminating or minimizing certain cleaning operations necessary with other methods. With the latter, the expense would be too high.

Working with a flexible, dry, abrasive-coated wheel and using Lea Compounds, the Judd people are producing a statuary bronze finish with a satin background. The same method is used whether it is a base metal followed by a copper or bronze plate, or a solid bronze.

Doesn't this work with the Judd Drapery Cranes suggest that you bring your finishing problems to Lea?

THE LEA MANUFACTURING CO.

Waterbury, Connecticut

Specialists in the Production of Clean-Working Buffing and Polishing Compounds

METAL INDUSTRY
VOL. 38, NO. 5 FABRICATION · ASSEMBLING · PLATING · FINISHING MAY, 1940

Hardness of Electrodeposits

Electrodeposits may possess amazing hardness, far exceeding that which is possible to obtain by severe cold working, alloying, or age hardening. Platinum, for example, is a very soft metal with an annealed hardness of 49 Brinell and it can be hardened up to about 110 Brinell by physical treatment. Electrodeposited platinum, however, may have extreme hardnesses of 600-650 Brinell.

Electroplated nickel may range in hardness from 150 to 550 Brinell, chromium from 400 to 950 and copper from 100 to 350 Brinell. These extreme hardnesses are characterized by high tensile strength and low elongation. Tensile strengths of 132,000 lbs./sq. in. have been obtained for hard nickel deposits with correspondingly low elongation of 1% in comparison with elongations of 15-30% and corresponding tensile strengths of 90,000-105,000 lbs./sq. in. for cold rolled nickel.

We are led to inquire how or why electroplated metals possess such high hardness. Hardness or resistance to deformation is caused by various agents or conditions tending to oppose slip along preferred crystal planes. This resistance increases with condition of strain in the metal, improper orientation of the grains (especially with metals outside the cubic system), foreign matter (e.g. oxygen) in the crystallographic slip planes, and small grain size.

All of these factors probably contribute to extreme hardness. Hydrogen, which is frequently stated to cause hardness, at least in the case of chromium deposits, has little or no effect on hardness. Hydrogen embrittlement is something apart from hardness.

Research has indicated more and more that anions affect the type of deposit obtained, and in many cases, actual presence of anions in the deposit, either by adsorption or codeposition, has been observed.

Age hardening in metals is dependent upon the presence of foreign atoms or molecules which either form incipient groups or "knots" in the crystallographic planes, or colloidal dispersions, which markedly increase the resistance to slip or hardness. It has been suggested by Desch and others that one explanation of the abnormally high hardness of electrodeposits, particularly nickel, may be due to the almost colloidal dispersion of foreign matter; for example, basic salts in the crystallographic planes of the metal or through the body of the crystal. In addition, these impurities may be finer than the colloidal state, being present substitutionally in the lattice, or intersticially. In this way, they produce noticeable strain in the lattice, and at the same time, resistance to deformation. The strained condition is rather characteristic of plated coatings.

Obviously, a contributing factor to hardness is fine grain size. In addition, the inter-crystalline space or grain boundaries in electrodeposited metals, may contain a higher percentage of impurities than is present in cast metal. This is indicated by the difficulty of re-crystallization and/or grain growth in electrodeposited coatings, which are diffusion processes, and also by the relative large amount of observable material after heat treatment.

The orientation of certain crystallographic planes of electrodeposited metals may contribute to directional differences in tensile strength, although this contribution should not be large for cubic metals with many planes of slip. Although one might expect, for example, hexagonal close-packed zinc to exhibit directional tensile properties if the coatings were to be deposited with preferred orientation. The extreme hardness of plated metals over rolled or cast metal is an advantage in increasing the wear resistance of such soft metals as platinum, silver and even chromium.

Prefinished Metals Find Many Applications

By H. W. Lancaster

Chicago, Illinois

Some of the many types of prefinished metals offered to industry are mentioned. The availability of plated metals enables the manufacture of articles with plated finishes which could not be applied economically after fabrication. Cases in point would be stove pipes, store fronts, shelving, table tops, etc. Prefinished enameled stock is also available in addition to all standard plated coatings. Various designs and decorative effects are also available.—Ed.

Manufacturers who wish to enhance the appearance of their products by means of attractively finished metals, or by the application of touches of color or bright metal, are finding that prefinished and preplated metals offer a possible solution of their problem. Furniture, novelties, electrical and mechanical appliances, toys, trays, costume jewelry, lamps, lampshades, and others without number; also domestic repair and replacement work, such as table tops, stove hoods, shelf covering, and countless other products too numerous to mention, are made from or have touches of preplated or prefinished metal.

Prefinished and preplated metals available today permit of a wide selection of color or plated finishes, offering a large variety of surface effects to relieve the monotony of toneless exteriors. The stock is sufficiently flexible to readily lend itself to punching, forming, bending, roll forming, and even slight drawing operations in the fabrication of entire products with no damage to the surface when properly handled. It can also be formed and applied to the surface of any product for decorative touches here and there.

Fig. 1. Apartment house entrance showing use of chromium plated copper for decorative effect over door, as well as on door and pylon lights.

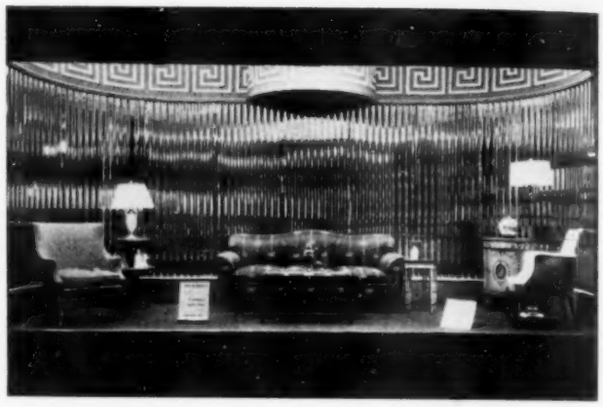


Fig. 2. Corrugated chromium-zinc background used in department store window display.

To meet the various production requirements—either for continuous feeding to automatic machines, or for other preferred production methods—prefinished and preplated stock is available in sheet form, flat strip, and coiled strip.

Many Styles and Designs to Choose from

All standard plated surfaces—chromium, nickel, copper, and brass can be had. Metallic red, yellow, green, blue, black, and a complete range of pigment enamel colors are also included in prefinished stock; in fact, any color or shade desired may be faithfully reproduced. Various combinations are possible,—chromium on copper, brass, nickel silver, or tin; nickel, copper, brass, and chromium on zinc or steel; other combinations too are possible if required. Base metals used are usually steel, zinc, brass, copper, tin plate, or nickel silver, all depending upon the requirements as to use and drawing ability, corrosion resistance, and expected service. Where service conditions require additional resistance to corrosion in cases where the product is exposed to moisture or dampness, a galvanized finish has frequently been applied as a ground coating for the enamel or other prefinish.

When one stops to think of the many combinations of metals that can be made, the different gauges of the base metal, the various sizes of sheets, the different widths of the flat and coiled strip, the innumerable designs and colors, one begins to see how large is the variety from which any manufacturer may choose some distinctive design to exactly fit his needs. One organization advertises

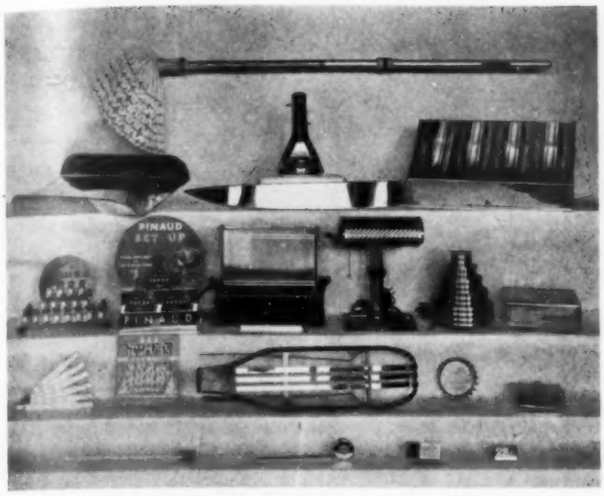


Fig. 3. Miscellaneous articles made in whole or in part from pre-finished and pre-plated metals.

that it has more than 100,000 items in its line of first-rate metals: zinc, brass, copper, steel, or tin-plate base metals in a variety of standard sizes and thickness; a selection of surfaces and tempers and a wide range of finishes in various metals.

Many beautiful surfaces have been worked out in distinctive plated colors and highly pleasing effects have been obtained by stripes—horizontal, vertical, diagonal, in squares and diamonds, and in other patterns. Many of these are in lustrous finishes, others in satin finish. Others are second in innumerable combinations of stripes, and other designs, and still others crimped or corrugated, offering a number of delightful effects. These usually are used in combination with bright, polished surfaces. Prefinished stock is also supplied in round-edge flat wire for decorative touches or for integral parts of certain products. It spot welds and solders easily, and its smoothly rounded edges prevent injury to workmen during fabrication and to the user of the product.

The wide range of widths and thicknesses available will meet the various individual problems of design, appearance, and usefulness. For certain other requirements prefinished metals are supplied with prefinished surfaces on

Fig. 4. Washing machine lids and splash rims made of chromium plated zinc.

Fig. 5. Stove pipe elbow made of chromium plated steel. Pipe lengths and collars are also made of the same material.

both sides of the metal sheet or strip. This is used where both surfaces are exposed to view.

Lends Itself for Architectural Purposes

An acceptable use of prefinished metal, particularly of chrome copper, has been found by architects for marquees, store fronts, trim for doors and windows; also for other practical purposes such as window display backgrounds, display boards for theatres and gas stations, etc. In this connection it has served successfully for years under severe weather and climatic conditions. Normal care must, however, be taken of it to keep it looking at its best. A washing with a solution of household ammonia keeps it in good condition when weather conditions have made it necessary to be cleaned.

Metal covered wood molding is also available. One manufacturer features a chrome zinc adapted for smart effects in equipment for cafes, cafeterias, show windows, certain fixtures in the home, and the like. It is rustproof as well as resistant to alkalies; has a mirror finish; and is easily cleaned with a soft dry cloth. This metal is manufactured by uniting pure nickel to selected rolled zinc by a process that is claimed to insure perfect adherence under any forming or stamping. It can be double seamed, soldered, crimped, and used for flat work as well as for merely decorative touches.

A metal board, which may consist of any of the prefinished metals constructed to securely adhere to a nonmetallic backing of any desired thickness, is another item which lends itself to a variety of uses,—architectural; advertising devices, such as display cards, cut-outs, etc.; and for many manufacturing purposes.

Requires Practically no Reorganization of Production Methods

Prefinished metal requires no plating, polishing, or lacquering after fabrication, and one of the great advantages of using this product is that no special machines or specially trained workmen are necessary. It fits easily into established production methods, and no more than ordinary care is required to protect the lustrous finishes

Fig. 6. Chromium plated steel was used for the decorative ceiling panels, and the underside of the luggage racks in this motor coach.

during fabrication. It comes ready for use with standard dies, standard equipment, and in accordance with standard machine and sheet-metal shop practices,—shearing, slitting, blanking, drawing, forming, bending, soldering, spot-welding, laminating, drilling, tapping, and certain types of spinning. Among those who have made use of this product are schools, architects, manufacturers, scientific laboratories, decorators, to mention but a few.

A Protection during Fabrication

As a direct aid in securing better results from deep drawing or severe forming operations, finished surfaces may be had covered with a special paper affixed with an adhesive which permits it to be easily rolled off when the products come off the production line. Not only does the paper protect the surface from being scratched or otherwise injured by direct contact with the forming tools, but it also serves as a cushion. With it draws and bends can be made without the slightest harm to the mirror-like finishes.

History of Prefinished Metal

The prefinished metal industry was established in Illinois in the late 1890's by Henry Schuessler who brought the process from Germany for the inexpensive manufacture of plated metal which could be converted into buttons, combs and novelties. At that time plating, particularly nickel plating, was synonymous with chipping and flaking, as seen on the plated parts of stoves and other castings. It was something new at that time to be able to apply a nickel plate on sheet zinc, which then could be stamped and formed without affecting the surface plating. Even by 1910 and several years after that household equipment and automobiles still contended with unsatisfactory plating of parts,—peeling still persisted. When preplated metal first made its appearance in this country, it was designed as "bonded metal" to distinguish it from the older type of plated work which had been so unsatisfactory and against which the public was rightly prejudiced.

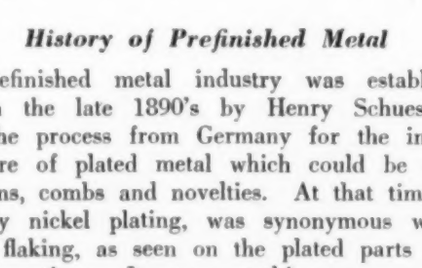


Fig. 7. Costume jewelry made from nickel-zinc.

True, in those days even the preplating of metals could not be done scientifically. The rule of thumb methods prevailed to a large extent in the manufacture of this product. Solutions were put together hit or miss, generators were overloaded, the thickness of the plate varied on one sheet as against another. Recognizing this fault, Mr. Schuessler set himself the task of putting the newly-born industry on a scientific basis, thereby to improve the product and secure production control.

Raw metals at that time were not what they are today. Even in 1915, the only metal used was zinc. Later tin-plate was added and these two materials constituted the sum and substance of the preplated metal industry up to the early 1920's. About this time, the terms "prefinished" and "preplated" were devised to describe the process more accurately and its scope and purpose, and these are the terms now generally used throughout the industry by both producers and buyers.

Since the year 1925, rapid strides have been made in the industry. In addition to plated sheet zinc, the process was extended to plating zinc in coils. And later, with the introduction of better sheet steel, it was possible to offer preplated steel in sheets and strips. Preplated brass, copper, and nickel-silver soon followed. Great strides are also being made with aluminum.

All this is due to better raw metal; the development of scientific plating control; the development of the stamping industry and the consistent improvement in fabricating tools. The growing competition for the attention of the buying public and the demand for an increasing variety of finishes; the introduction of plastics, which has popularized metallic embellishment; and a keener competition for profits; have all been the incentives for greater and greater achievement in this industry. The metal stamping machines alone have done much for the industry. Before their advent the use of prefinished metal was confined to a few elementary shapes and to items that could be cut by hand and soldered. Today most of the prefinished metal is consumed in stamping and drawing presses from which pour a mass of items that would have been impossible, even unbelievable, some twenty years ago. Tools have been developed to a point where metals can be stamped and rolled into mouldings and other shapes without in the slightest defacing the lustre. And now, with the adhering paper covering, operators have been enabled to accelerate the handling and stamping of prefinished sheets and coils which, when unprotected, frequently required special attention to avoid defacing the fine finish.

EDITOR'S NOTE: For supplying certain data as well as the loan of pictures used in this article, we acknowledge the courtesy of the following manufacturers of prefinished metals.

Acme Steel Company, Chicago, Illinois.

American Nickeloid Company, Peru, Illinois.

Apollo Metal Works, Clearing Station, Chicago, Illinois.

Electrodeposition on Plastic Materials

By James J. Bayard

New York

Various methods for making plastics electrically conductive are described. These include metal spraying, cathode sputtering, metal evaporation and chemical reduction of silver. Metal powder methods using lacquers, varnish or shellac are described in detail in the 1940 Edition of Plating and Finishing Guidebook published by Metal Industry.—Ed.

Years ago, when electroplating was in its infancy, practitioners of the art whose scientific foundations were laid by Faraday in 1830, occasionally startled and amused their customers and acquaintances with examples of a new technique which they called metallizing. They took non-metallic objects of all kinds, running the gamut from plaster casts to human hands and coated them so that they seemed to be made of solid metal. Fragile flowers, articles of celluloid (granddaddy of plastics) were covered with metal for the plater's personal edification and for those people who could afford to pay the high prices this form of artistry and skill commanded. Metallizing, hybrid offspring of electrodeposition never assumed any particular importance and with the exception of baby shoe preservation, which to this day is a thriving minor business—no pun intended!—gradually fell into disuse as electroplating proper found its niche in the commercial world.

With the recent mushrooming of the plastics industry, a sudden revival of interest in the metallizing of non-conductors has been awakened. Starting in the novelty and costume jewelry field where there is always a demand for something new and different, the plating of metals on plastic materials has become increasingly popular and more and more uses are being found for metallizing.

One can now get a nice looking silver fountain pen that is inexpensive and almost as light as a feather quill because it is made of a plastic plated with silver. Plastic bottle caps, containers, clock cases, electrical parts and picture frames are finished with metal. Condensers and efficient radio shields are additional items that can be made by metallizing plastics. The list of uses keeps growing.

Naturally, with the renaissance of this branch of the plating art, investigations have been made to find better ways for producing the initial electrically conducting film that is the necessary foundation for subsequent electrodeposition of metal. Of the methods available there are about five, each with its own particular advantages and faults. These methods are the following:

A. The varnish-conducting powder method
B. The metal spraying pistol
C. Cathode sputtering
D. Metal evaporation
E. Chemical reduction

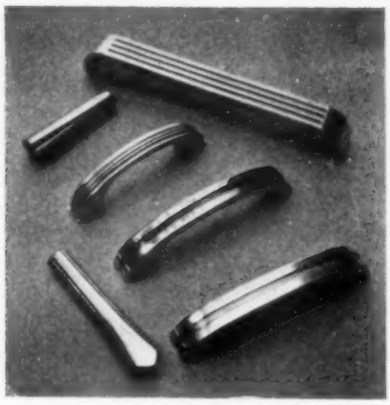
The varnish or shellac conducting powder method is the oldest of all the methods. It is the method that was, and still is being used today by the old time platers for plating on plaster, rubber and leather. It will not be described here as it is fully discussed in the 1940 edition of the Plating and Finishing Guidebook. It produces excellent, adherent metal deposits in many cases but it is nevertheless unsuitable for any type of volume work because of the time consumed and the skill required in the varnishing and powdering operations. Another point to consider is the fact that the method makes for non-uniform deposits and for this reason: The bronze powder, as spread on the surface of a baby shoe for example, is practically a non-conductor of current or at best, a semi-conductor, as ohmmeter tests will readily demonstrate. This is due to the fact that actual contact between the copper grains is prevented to a great extent by the non-conducting, non-volatile solids of the varnish or shellac with which it has been mixed. When a shoe prepared by this method is placed in a copper bath for deposition, the copper starts to plate first at the points where electrical contacts are made, gradually bridging the gaps between the powder grains until the whole surface is covered throughout. This means that the copper deposits will always be heaviest at the points of electrical contact. Of course in the case of work such as baby shoes, this is no serious objection but where specifications are to be met, it is. Another fault of the method is its tendency to produce an "orange peel" effect if it has not been properly applied.

Metal Spraying Method

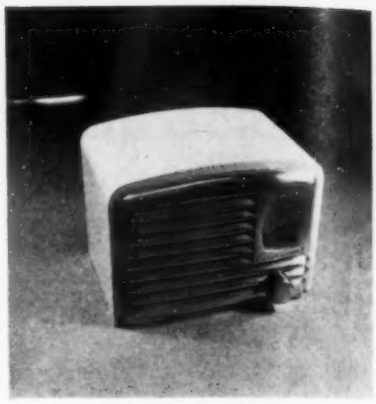
The metal spraying pistol can very often be used to produce a first metal coating on a plastic article and sometimes even eliminates the use of a plating bath for building up the metal thickness. With this method, the work is first cleaned and the surface roughened by a sand blast, to produce an adequate anchorage, after which molten metal, preferably a low fusing alloy, is atomized and sprayed through a heated air gun at the work. Just as in spray lacquering, the object is rotated until it is completely covered with metal. It can now be plated in a cyanide copper bath and from this point on given any particular finishing treatment desired. While this method can lend itself to some types of produc-

Examples of Plated Plastics

Plastic ornaments.



Plated plastic handles.



Plastic front of radio is plated to give a two-tone effect.

tion work, it has the unfortunate tendency of producing a granular or "sandy" effect, much more pronounced than an "orange peel." The reason for this is twofold. First, the surface has been roughened by the sand blast; second, when the spray pistol is held too far from the work the metal particles pile up in a "sandy" or loose formation. This faulty structure is magnified by subsequent electrodeposition. If the metal pistol is held closer to the work to correct the condition, the heat developed may burn or soften the pastic material.

Cathode Sputtering

The cathode sputtering process is probably the most costly of all the methods. The non-conducting object, which acts as an anode is placed in a vacuum chamber opposite a number of cathodes made of the metal (generally silver or gold) to be sputtered. After a sufficiently high vacuum has been achieved, a charge of 10,000 to 20,000 volts is put on the electrodes and molecules of metal are literally torn out of the cathode to deposit on the non-conducting substance. When the object is coated with a layer of metal a few molecules thick, the process is completed, the vacuum chamber opened and the work can now be placed in an acid copper plating bath, providing a suitable electrical connection has been made.

From a description of the process, it can be seen at once that the method is out of the question for practical production purposes because of the high cost of the apparatus, the time consumed in pumping and the wasteful use of silver and gold. (The metal atoms are sprayed from the cathodes in all directions.) Yet in spite of this, the method has two successful applications. In record manufacturing, the freshly cut plastic master record is often sputtered with a layer of gold a molecule or so thick and subsequently plated with copper to produce a metal matrix. This is not truly metallizing but is a form of galvanoplasty or mold making, inasmuch as the metal deposit is finally stripped from the plastic record to form the "master" shell.

The manufacture of tinsel and gift wrapping paper makes the second successful application of sputtering. Here, cellophane is slowly unrolled in the vacuum chamber on to another roll while passing in front of silver electrodes. This produces silver coated cellophane. It is not given any further coating of metal.

Metal Evaporation

Metal evaporation is somewhat akin to sputtering. The plastic or non-conductor is placed in a vacuum chamber and the metal to be evaporated arranged in filament form is heated to incandescence by an electric current. The evaporated metal, just like steam, condenses on the cooler plastic, coating it with a thin film of metal. The method suffers from the same faults as the sputtering process with regard to production and cost. However, a commercial application of metal evaporation will soon appear on the market. Rayon will be coated with aluminum by the evaporation method to produce beautiful, metallized cloth with the appearance of silver lame.

Silvering Processes

The chemical reduction process while old, is probably the best all around method for the production plating of plastics. Basically, the method is this: A thin film of silver (or copper) is precipitated on the perfectly clean plastic by the reduction of the metal from its compounds with one or more chemical reduction agents.

Years back, platers made use of the method in this manner: They would clean the non-metallic object well then dip it in a solution of white phosphorous dissolved in carbon disulphide. After removing the work from this bath, they waited for the disulphide to evaporate off, then quickly painted the object with a solution of silver nitrate which was immediately reduced by the phosphorous to form a layer of silver on the object. This method had to be given up as the phosphorous was inflammable and poisonous and produced gangrenous burns and the disulphide was toxic and malodorous as well.

The methods of the mirror makers were taken up next. Here, solutions of silver oxide are reduced by chemical compounds, such as formaldehyde, grape sugar and rochelle salt. First the work is well cleaned, then it is placed in a trough and the silver solution is poured in simultaneously with the reducing solution. After a few moments, the silver is reduced, forming a thin film on the object. This basic method for producing an initially conducting surface on plastics has many faults inasmuch as surfaces touching the tank or trough are not covered with silver and a large part of the silver precipitates on the sides and bottom of the tank as well.

(*Concluded on page* 259)

Ancient Trade Guilds

By Joseph Danforth Little

Nutley, New Jersey

The author continues his interesting discussion on trade guilds of Europe describing their spirit and mode of operation.

In England there are many old trade guilds but most of them have lost their original value. In the history of the decorative arts, nothing is more interesting than the story of the ancient guilds. The trade association is one of the oldest and most universal institutions of the world. Holy Scripture tells us how in the time of St. Paul one, Demetrius, a silversmith of Ephesus, roused his fellow-craftsmen with the cry, "Sirs, our craft is in danger". It is pretty certain Demetrius could not have brought about the uproar in the theatre at Ephesus unless the silversmiths there had been an organized craft, and there are indications of trade organization from the very earliest times. It is certain that trade guilds were

Jealously the old guild masters guarded the reputation of their craft.

general throughout the Roman Empire, and after the fall of Rome, like many other Roman Empire institutions, were initiated in the succeeding kingdoms. Trade guilds were general in the time of the Norman kings.

In England and also in France, in the middle ages, the arts and crafts were protected by the formation of guilds. One of the earliest trade bodies of which we have a record, is the "Guild of Goldsmiths of London", ranked in history as one of the most important and influential of all crafts. A fraternity of master workers of goldsmiths was formed to maintain community interests in 1180. Its object being "for the promotion of trade and moral worth". Its quarters were originally in Foster Lane then called Goldsmiths' Row, where Goldsmiths' Hall still stands. Like many of the older guilds it was of a semi-religious order, mainly caring for the maintenance of the standards of quality of materials used and of the work turned out.

Members of the guild were craftsmen and cunning workers as the rare pieces of early make still extant show. Unfortunately, the records of the earliest happenings of the guild were lost in the great fire of London, but in the magnificent Hall there are many rare relics which were made by the early members.

The guild was incorporated under the name of "Wardens of Goldsmiths of the City of London". They received their first charter from Edward III, which set forth a series of strict regulations to govern the making and selling of gold and silver wares, and for the protection of honest craftsmen and also the public. They had control in these matters over all England. The guild has, like few others, retained its beneficial influence on the trade, and it is still hall-marking all silver and gold produced within its jurisdiction, thus performing a useful function to the state, taking part in the regulation of trade and commerce.

Marks of Quality

Marks for gold and silver wares were introduced and by these marks the name of the maker of an article could be identified. These marks also indicated that the article in question had been pronounced up to standard by appointed authorities. The wardens used to make periodical visitations not only in London but also throughout the other important cities of England. They had the power to correct any abuses which had crept into the trade, to search for false wares and to imprison or fine any person who made such false wares, and to confiscate all forgeries. The makers were brought to trial before the Guild Council. The standards of the guild were inflexible and heavy punishments were inflicted upon the guilty. Fines were paid in money or "Pipes of Wine". A pipe of wine was a cask containing two hogsheads or 126 wine gallons.

There is an interesting record of 1597 concerning the conviction and sentence of two men who had made a counterfeit article and stamped counterfeit marks thereon. They were sentenced to stand in the pillory at Westminster with their ears nailed thereto and with a paper above their heads stating their offense to be "for making false plate and counterfeiting their Majesties' touch". They were then put in the pillory at Cheapside, had one

A
TOUCH-STONE
FOR
GOLD and SILVER Wares.
OR,
A *Manual* for *Goldſmiths*,
AND
All other Perſons, whether Buyers, Sellers, or Wearers of any manner of GOLDSMITHS Work.

DISCOVERING
The *Rules* belonging to that *Myſtery*, and the Way and Means how to know Adulterated WARES from thoſe made of the True Standard Allay; And what are the True Weights appointed for weighing of the ſame.

Together
With the ſeveral STATUTES now in Force for Regulating Abuſes committed in that Craft. And the *CHARTER* of the Goldſmiths *Incorporation* taken from the Record and truly rendred into Engliſh.

To which is Annexed
The *LAWS* in force againſt Braſs Hilts, and Braſs Buckles, &c. And Directions for Diſcovering the Counterfeit Coyn of this *KINGDOM*. And alſo a Catalogue of the Forraign Coyns, with the particular Weights, Allay, and Value of each Coyn.

By *W.B.* of *London*, Goldſmith.

London, Printed for *John Ballinger* in *Clifford's-Inn* Lane, And *Thomas Baſſett* at the *George* near *Clifford's*-Inne in *Fleet-ſtreet*, 1677.

Title page from "Touchstone" of 1677.

ear cut off and were then taken to Foster Lane to Fleet Street and had to pay a fine of ten marks. Edward IV gave the Goldsmiths' Guild additional powers. They were permitted to use a common seal and they also had the right to hold land.

Spirit of Workmanship

Undoubtedly, we all have seen in the museums of Europe and America, or pictured in old books, fine examples of the art of the silversmiths of old. Something more than skill and a lifetime experience enabled these old guildmen to win for their work the admiration of the world. Workers in gold and silver have generally been among the most prominent craftsmen and that is as it should be, for the metals from the very earliest times represented the wealth of the nation, not only in bullion and coined money but in jewelry and articles of beauty and utility in silver. The Goldsmiths' Guild, like other guilds has, of course, completely changed in character. The early stage was the golden age of trade guilds. As they increased in wealth and power, not only their original character changed but they lost their original object as well. Dominating the thoughts as well as the hands of these guildsmen as they worked, was pride in the skill which made possible their fine achievements, and greater pride in the guild spirit. These high thoughts were ever with the guildsmen as they worked, lending greater deftness to their hands and greater beauty to their masterpiece.

In these old industrial guilds of goldsmiths and silversmiths, it was the creation of ideals and beautiful forms, rather than a pecuniary return that inspired the members, increased their love of and for the craft, and elevated it above commercialism. Under that spirit, no man thought of his work as a task, but as an art. No man was driven or would impair his art by hastening his work. Patient toil made each piece of gold or silver a masterpiece. *No man thought to give less than the best that there was in him for the honor of himself and the Guild. Under that spirit the Guildsman's hand took on the touch of genius and produced masterpieces of the silversmiths' art.* Frequently these old guild ideas and traditions were passed down from father to son through several centuries.

The craftsmen of the ancient Guild of Goldsmiths of London and their great love for the guild is not unfamiliar. Oftentimes, beneath the arched windows of the old Guild Hall or in some quaint shop, a worthy guildsman toiled for months and some times for years, on a piece of silver, such as a tankard, beaker, or a bowl, which would one day grace the table of some English queen or duke. In reverence the old masterpiece was conceived. Jealously the old guild-master guarded the reputation of his craft, and when he had completed a

Top, St. Dunstan the patron of goldsmiths, and bottom, a refining furnace and metal working.

piece worthy of his stamp and a credit to his guild, he would send it to Guild Hall where it would be tested by the warden, appointed by the Crown, and if found up to standard, the warden would stamp it with the Hall Mark, and then the maker would, with just pride, stamp it with his own stamp, even as Cellini did a golden vase or as Raphael signed a painting. Centuries have passed since first a master's signature became the symbol of a priceless craftsmanship, but there are still a few silversmiths in Europe and America making silverware entirely by hand, without the aid of any mechanical tool, who are justly proud of their work and their ability. All gold and silverwares manufactured in London today, must be assayed and stamped at Guild Hall.

Guildsmen As Bankers

The Guild of Goldsmiths became a powerful fraternity. As time went on, the function of the goldsmiths of London became more extensive. These traders lent money and bullion to the King and nation and in many instances provided for the country's needs in time of war. Until about 1700, the goldsmiths were the only bankers of the community. There were no others, and a number of the older firms of bankers still existing, had their origin in a goldsmith's shop. The earliest form of bank notes used was called "Goldsmith's Notes". Goldsmiths also supplied the bullion for foreign trade and in those times of insecurity it was the fashion to carry about one's more valuable articles of personal adornment such as gold sword hilts, buckles, chains, and rings as the safest and readiest way of holding value, quite as much as gratifying personal vanity.

Other Guilds

There were many other Guilds such as The Girdlers' Guild, founded in 1448; The Broders', founded in 1561; The Comb Makers', founded in 1636; The Gold and Silver Wire Drawers', founded in 1693; The Fan Makers', founded in 1719; The Cordwainers' Guild, founded some fifty years before Columbus sailed on his voyage of discovery to America. The charter of this last named guild was granted by King Henry VI. Some people today confuse these guilds with the modern trade unions. As a matter of fact, as many differences as resemblances mark the two. The ancient guild was the organization of all the members of a craft, employers, journeyman, and apprentices and not merely of employees. It was a community in and of itself with certain rights and prerogatives respecting its trade, commonly recognized, and usually confirmed by royal charter. It is interesting to note that The Cordwainers' Guild which was originally a guild of workers in leather or shoemakers, recently acquired a new member—the Prime Minister of the United Kingdom—Mr. Neville Chamberlain. He was accepted for two reasons, one, because he is a distinguished person; two, because for a century or so, other members of his family have been on the guild roster. His predecessor in office, now, Earle Stanley Baldwin, is honorary assistant of that same guild or society. Like other medieval trade guilds, the Cordwainers' Company nowadays finds its chief avocation in the preservation of tradition, in social intercourse and in philanthropic work. It is presumed that the Prime Minister will not be required to demonstrate his proficiency with the awl, nor will he be required or expected to stock the shoemakers' last.

Electrodeposition on Plastic Materials

(*Concluded from page* 256)

Metaplast Process

Research and investigation have improved this basic method considerably. A production schedule for plating on plastics such as is used by the Metaplast Corporation of New York runs something like this:

1. The pieces to be plated are cleaned in a mild alkaline cleaner. The pieces are mounted on a rack or held in a dipping basket, depending on size.
2. The pieces are water rinsed then given a dip in dilute acid after which they are again water rinsed and drained off.
3. A special bonding metal coat (mainly silver) is applied to the work either in a barrel or a tank. The properties of this secret solution are such that it permits the actual penetration of metal into the pores of the plastic and thus assures perfect anchorage to the surface of the work. As the barrel rotates, silver is reduced and deposited uniformly over the plastic surface.
4. The work is emptied from the barrel, rinsed and placed into a regular plating barrel and acid copper is deposited. After a sufficiently heavy deposit of copper is put on (from 0.001" to 0.01"), the work can be put into a burnishing barrel for polishing. From this point on, any conceivable metal finish may be given it as it is to all purposes solid metal. If in all these procedures the work in question is not suited for barrel treatment because of its size, shape or other considerations, it may be mounted on racks or wires.

This method is unquestionably good for metallizing inexpensively on a volume scale. It produces dense adherent deposits of metal that do not blister from the plastic surface on polishing or tumbling. If desired, some of the plastic surface may be stopped off so that no metallization takes place, thus producing interesting effects.

Another, later variation of the method, is the direct spraying of the plastic with a silver nitrate ammonia solution and a reducing solution, from a specially designed nozzle. The silver nitrate is reduced to metallic silver in mid air and coats the plastic article with a thin layer of metal which can be subsequently electroplated.

The only drawback to the chemical reduction method for plating on plastics is the fact that the silver solutions used tend to be highly explosive in nature. However, if proper care is exercised there is absolutely no danger and the method lends itself to the rapid, satisfactory metallizing of plastic materials.

Analysis of Free Sodium Cyanide in Brass Plating Solutions*

By Wallace M. McNabb and Samuel Heiman

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The authors have studied Pan's method for determining free sodium cyanide in brass plating solutions. Pan's method in which the free cyanide is assumed to be that in excess of $Na_2Cu(CN)_3$ and $NaZn(CN)_3$ was found to be fortuitously correct. This is only correct under definite conditions of pH of the solution and temperature of analysis. The authors' work indicates that a brass plating solution is a mixture of $NaCu(CN)_2$, $Na_3Cu(CN)_4$, $Na_2Zn(CN)_4$ and Na_2ZnO_2 with other complexes.—Ed.

THE concentration of free sodium cyanide in brass plating solutions is important because it affects the anode and cathode efficiency, anode polarization and corrosion, throwing power and conductivity of the solution; and because it influences the composition, color, structure, and ductility of the deposit[3, 12]. The term "free cyanide" may be defined in two ways: (1) as the excess of alkali cyanide above the minimum required to give a clear solution[1], or (2) often as the excess of sodium cyanide above that required to form definite copper and zinc complex compounds as determined by chemical analysis.

The first definition seeks to specify that property which directly affects the behavior and utility of the bath, rather than to offer an exact knowledge of the complex cyanides which may exist in the solution along with the free cyanide. The most important property specified by this definition is the solvent action of the free cyanide on the anode film. Thus, a solution containing no free cyanide, according to this definition, will have no solvent action on the anode film and the free sodium cyanide concentration will therefore be a direct measure of the solvent power of the solution. To date, no analytical methods have been published for determining the free cyanide as first defined; it is doubtful whether this definition could be applied to the mixture of complex copper and zinc cyanides which are present in a brass plating solution.

In considering the simpler case of the cyanide copper bath, experiments were made to determine the minimum concentration of sodium cyanide required to give a clear solution. Theoretically, one equivalent of sodium cyanide should dissolve one equivalent of cuprous cyanide to give a clear solution of sodium copper cyanide. This fact was indirectly demonstrated in the following way:

A diluted sample of a complex cyanide copper solution was titrated with 0.1 *N* hydrochloric acid. A turbidity was first obtained when all the constituents of the bath had reacted with or been neutralized by the acid, except the complex compound corresponding to the formula $NaCu(CN)_2$. The further addition of acid to the solution containing this complex compound caused a turbidity due to the precipitation of copper cyanide. On the other hand, the addition of one equivalent of sodium cyanide solution to one equivalent of copper cyanide did not give a clear solution of sodium copper cyanide, even after the suspension had been agitated several hours at room temperature. Further additions of sodium cyanide solution dissolved more and more of the copper cyanide, but even after the addition of two equivalents of sodium cyanide, the solution was still somewhat turbid.

It was thought that freshly prepared copper cyanide might be more soluble in sodium cyanide solution than the dry reagent powder used above. Warm, dilute solutions of sodium cyanide and copper sulfate were mixed and the copper cyanide was washed by decantation three times with hot water. To this definite weight of copper cyanide, a solution of sodium cyanide was added in small increments and the suspension was agitated after each addition. The results, however, were the same as those obtained with the dry copper cyanide. There was no definite point at which a clear solution was obtained even after adding two equivalents of sodium cyanide to one equivalent of copper cyanide. This permanent turbidity may have been caused by the formation of a small amount of paracyanogen, a brown solid which is probably a polymerized form of cyanogen.

These tests indicate the difficulties which must be confronted in attempting to devise analytical methods to meet this definition of free cyanide, especially for brass plating solutions.

According to the second definition, the free sodium cyanide in a brass plating solution is usually determined by direct titration against standard silver nitrate solution in the presence of potassium iodide as an indicator. Several variations of this general method are reported in the literature[6, 9, 12, 13]. However, there is no generally accepted procedure for this analysis, for it is known that the result obtained depends on the amount of dilution of the sample, the concentration of the potassium iodide used as indicator, and the concentrations of sodium carbonate and ammonia in the brass plating solution. From the total cyanide content, which may be conveniently determined by an evolution method used in connection with the analysis for ammonia, the free sodium cyanide may be calculated, assuming that definite copper and zinc complexes are present in the bath[6].

Pan has studied the effect of the afore-mentioned variables on the titration method and as a result of his work recommended the following procedure[12]:

* Reprinted from Industrial and Engineering Chemistry, Analytical Edition, **12**, No. 3, pp. 161-163, (1940).

To 10 ml. of the brass plating solution were added 4.3 grams of potassium iodide (14.3 ml. of 30 per cent potassium iodide solution) and sufficient water to make the volume 70 ml. at the end of the titration. The solution was then titrated with 0.1 *N* silver nitrate solution to the appearance of a faint bluish opalescence. The free sodium cyanide in grams per liter may be found by multiplying the milliliters of 0.1 *N* silver nitrate by 0.980. The authors in their work found that this end point was not very sharp. The further addition of about 1 ml. of silver nitrate solution beyond the end point did not increase the density of the opalescence. The end point was detected more readily by comparing the unknown solution during the titration with samples of distilled water and with a solution already at the end point.

Pan further showed that the free cyanide in a brass plating solution as determined by this method corresponds to that calculated value of the sodium cyanide that is in excess of that required to form $Na_2Cu(CN)_3$ and $NaZn(CN)_3$ instead of $Na_2Cu(CN)_3$ and $Na_2Zn(CN)_4$ as was generally assumed[2, 14]. One object of this investigation was to check the validity of this conclusion.

TABLE I. ANALYSIS OF CHEMICALS USED IN BRASS PLATING SOLUTION

	Purity Based on Metal Content	Purity Based on Cyanide Content By evolution method	By direct titration
	%	%	%
NaCN, C. P.	....	96.37	96.50
CuCN, C. P.	99.89	98.67	....
$Zn(CN)_2$, tech.	95.44	93.06	....

In the first place, Pan did not state the purity of the chemicals used in preparing his solutions. Even C. P. sodium cyanide is only about 97 per cent pure and the authors were unable to obtain C. P. zinc cyanide. His work was therefore repeated using analyzed reagents. The cyanide contents of copper, zinc, and sodium cyanides were determined by an evolution method[10, 11], and the sodium cyanide was also analyzed by direct titration with standard silver nitrate solution[8]. The copper content of the copper cyanide and the zinc content of the zinc cyanide were determined by standard methods. Table I gives the results obtained. All results are the mean of at least two determinations.

A brass plating solution similar to that used by Pan[12, 14] was prepared which had the nominal compositions given in Table II. The theoretical concentration of free sodium cyanide, in excess of that required by the copper and zinc cyanides present to form $Na_2Cu(CN)_3$ and $NaZn(CN)_3$, is given as well as the experimental titration values at 15° and 20° C.

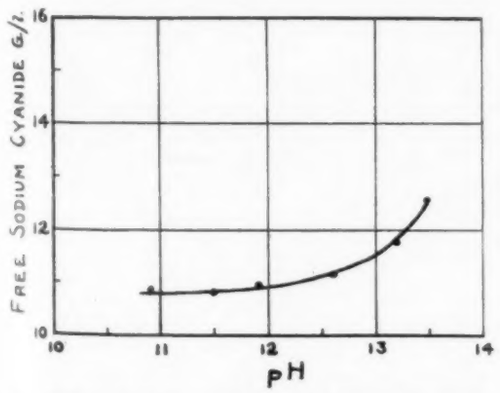

Fig. 1. Effect of pH on value of free sodium cyanide as obtained by titration method at 30° C.

The calculated value of the free cyanide for this solution based on the concentrations found as a result of the analyses given in Table I is 9.22 grams per liter. This value is 2.01 grams per liter lower than Pan's calculated value of 11.23 which was based on the incorrect assumption that the chemicals were 100 per cent pure. The experimental values are still in fair agreement with the calculated value and therefore apparently check Pan's conclusion that this procedure determines approximately the free sodium cyanide in excess of the complex compounds $Na_2Cu(CN)_3$ and $NaZn(CN)_3$.

TABLE II. BRASS PLATING SOLUTION

	Grams/liter
Cu	22.35
CuCN, C. P.	31.50
Zn	6.40
$Zn(CN)_2$, tech.	11.50
NaCN, C. P.	50.50
Na_2CO_3, C. P.	30.00
Calculated free NaCN, assuming chemicals are 100 per cent pure (Pan's value)	11.23
Experimental values (Pan's method)	9.60 at 15° C.
	10.10 at 20° C.
pH, colorimetric	10.8

However, Pan did not study the effects of the pH and of the temperature of the bath on the value of the free cyanide obtained by the titration method, although these factors should have a considerable effect. Springer[15], Hogaboom[7], and Graham[5] have discussed the pH of brass plating solutions, but not with respect to its effect on the determination of free cyanide. In studying this problem, various amounts of sodium hydroxide were added to plating solutions of the composition given in Table II. The pH of the sample was measured colorimetrically and the free cyanide was determined on 10 ml. by the Pan titration method. The temperature was 30° C. The indicators used to cover the pH ranges were: LaMotte Purple 9.6-11.2, Sulfo Orange 11.0-12.6, and LaMotte Violet 12.0-13.6. The results are plotted in Figure 1. The value of the free cyanide increases slowly when the pH is raised from 11.0 to 13.0. A further rise in pH, however, causes a rapid rise in the free cyanide. This is caused by the reaction of sodium hydroxide with the cyanide zinc complex, to form zincate and liberate an equivalent amount of sodium cyanide which is titrated as "free sodium cyanide." If sufficient alkali is added to a brass plating solution, all of the sodium cyanide equivalent to the cyanide zinc complex will be titrated[8]. The increase in pH, however, has no effect on the cyanide copper complexes, since copper is not amphoteric.

In studying the effect of temperature of the titration, a brass plating solution of composition given in Table II and with an initial pH of 10.8 was analyzed for free cyanide at various temperatures. The results are plotted in Figure 2. The broken line (*a*) in Figure 2 gives the calculated value of the free sodium in excess of that required by the copper and zinc cyanides to form $Na_2Cu(CN)_3$ and $NaZn(CN)_3$. This value is 9.22 grams per liter. Line (*b*) gives the calculated value of 4.64 grams per liter for the free sodium cyanide in excess of that required to form $Na_2Cu(CN)_3$ and $Na_2Zn(CN)_4$. Only at a relatively low temperature (12° C. or 54° F.) do we obtain a value of free cyanide that corresponds to the

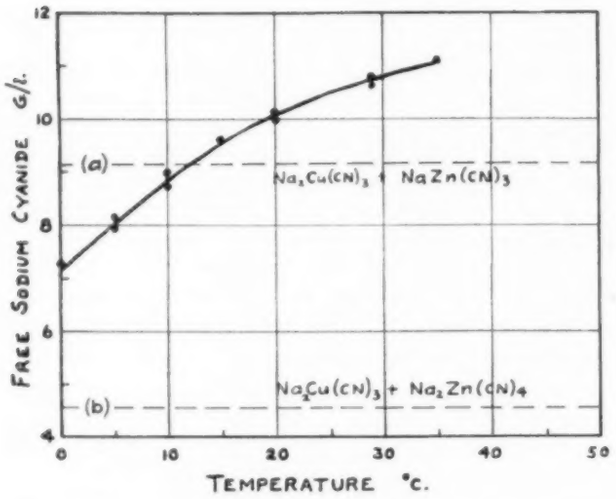

Fig. 2. Effect of temperature on value of free sodium cyanide as obtained by titration method at pH 10.8.

excess above that required by the copper and zinc cyanides to form $Na_2Cu(CN)_3$ and $NaZn(CN)_3$. This agreement, to which Pan attached so much importance was, therefore, entirely fortuitous.

It is seen that raising the temperature has a pronounced effect in increasing the free cyanide concentration as obtained by this titration method. The reasons for this are as follows: There is considerable evidence in the literature that several complexes of copper exist, such as $NaCu(CN)_2$, $Na_2Cu(CN)_3$, and $Na_3Cu(CN)_4$[4, 16]. The principal effect of an increase in temperature of the brass plating solution is to dissociate these complexes progressively into simpler compounds and sodium cyanide. Therefore, at least two and possibly all three of these complexes must be present together in brass plating baths. On the other hand, we are not certain that an increase in temperature will cause $Na_2Zn(CN)_4$ to dissociate into $NaZn(CN)_3$ and NaCN, since there is little if any evidence that the latter complex exists. However, an increase in temperature raises the pH by increasing the hydrolysis of the free sodium cyanide and carbonate present, and this in turn, due to the amphoteric nature of zinc, increases the free sodium cyanide in the manner pointed out above.

Summary

Of the many methods reported in the literature for the analysis of free sodium cyanide in brass plating solutions, the method investigated by Pan is the most satisfactory. This will yield reproducible and useful values only if the limits imposed by the sodium carbonate and ammonia concentrations are realized and if the dilution, temperature, and pH are carefully controlled.

It is true that the titration, when carried out under certain arbitrary conditions—i.e., dilution to 70 ml., pH of sample 10.8, and at 12° C.—gives a value of free cyanide which may be mathematically and arbitrarily considered as the amount in excess of the compounds $Na_2Cu(CN)_3$ and $NaZn(CN)_3$. However, this is not valid evidence that such a compound as $NaZn(CN)_3$ exists, as Pan contends[14]. The authors' results indicate that a brass plating solution is a mixture of $NaCu(CN)_2$, $Na_2Cu(CN)_3$, $Na_2Zn(CN)_4$, Na_2ZnO_2, and possibly other complexes such as zinc ammine. The equilibrium among these complexes, and consequently the value of the free sodium cyanide, is shifted by changes in the concentrations of the constituents of the solution, the temperature, and the pH.

As Blum[1] has indicated in general for all cyanide plating baths, it is better to consider this method as giving a quantity which can be readily measured for control purposes. Experimental work is necessary to establish the quantitative relationships between the free cyanide as determined by this method and the various properties of the plating solution and of the brass deposits, which the free cyanide concentration is known to influence.

Acknowledgment

The authors gratefully acknowledge a grant from the Faculty Research Committee of the University of Pennsylvania, and wish to thank A. Kenneth Graham and H. J. Read for discussing the results of this paper with them.

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Tanks For Cleaning and Plating

By Clarence C. Helmle

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The author presents a resume of the properties of tanks for plating and chemical use. Tanks discussed are wooden, steel, stoneware, organic molded, lead lined, rubber lined, enameled, vitreous brick and clad. Synthetic organic coatings are also included.

All too often, tanks which are to be used for plating and cleaning purposes are not given the consideration they deserve as an essential part of such processes. On the other hand, many times, increased efficiency, improved working conditions, trouble-free operation, prolonged life, low maintenance charges are sacrificed for the sake of conserving a small increase in the contemplated capital investment. The following is proposed as a guide and "food for thought" to those concerned with the utilization of such equipment. It is, however, always advisable to consult the manufacturers and take advantage of their experience; profiting also by the opportunity for mutual suggestions.

The solutions to be used will for the main part determine our choice of construction materials. The choice and design, however, may be further influenced by the permissible floor loads, method of heating, weight and size of work, floor conditions, drainage, illumination, ventilation, working conditions and workers safety. Today, more than ever before, it is possible for the plater to obtain tanks which will satisfactorily meet his requirements.

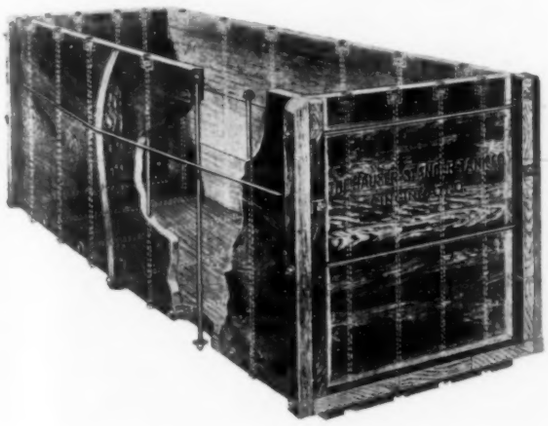


Fig. 1. Phantom view of wooden tank showing method of bolting together.
(Courtesy the Hauser-Stander Tank Co., Cincinnati, O.)

Clarence C. Helmle

Wood Tanks

Wood tanks continue to enjoy a respected place in the needs of the plating room. While wood is being supplanted to some extent by other materials for certain plating solutions, it continues to be among the best for mild acid solutions and rinse waters. These tanks offer advantages in cost, ease of shipping and absence of such contaminating effects as rusting. Somewhat more difficulty is experienced with the incorporation of such features as sumps and pitched bottoms than with some other materials, but on the other hand, recommended applications seldom require these features.

Tanks made of wood are not particularly suited for caustic soda solutions, and other materials should be investigated for these applications. While wood resists most acids, it should not be used for nitric acid solutions. It has been found that all woods are most detrimentally affected by caustic soda and nitric acid.

The woods most commonly employed are Tidewater Red Cypress, Douglas Fir, Long Leaf Yellow Pine, California Redwood, Maple, and Oak; of these, Cypress is best, followed by Fir and Pine. Cypress gives the best durability for all-around use. Fir approaches Cypress in quality, and although it does not furnish the durability of the latter, this is somewhat offset by its lower cost.

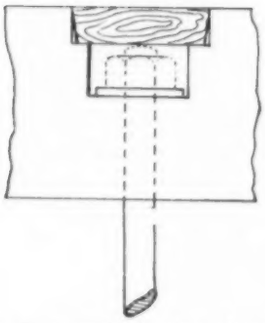


Fig. 2. Detail drawing showing how the vertical tie rods are placed through the body of the tank.

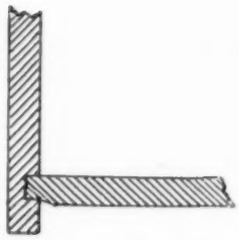


Fig. 3. Detail drawing showing how ends of tank are crozed into sides and bottom.

(Courtesy of the Hauser-Stander Tank Co., Cincinnati, O.)

Long Leaf Yellow Pine with its characteristic high rosin content is generally best used for pickling tanks.

Wood tanks may be rendered suitable for other applications by being lined with lead, rubber, synthetics or acid-proof brick. Such construction takes advantage of the low external maintenance generally characteristic of wood tanks. In small pickling installations, both plain and lead-lined wood tanks are employed, but generally, high upkeep charges are against the lead-lined tanks when used for large pickling tanks, unless these linings are given protection against mechanical damage by installing an inner protective lining of wood, framed in, without metal parts inside the tank, or brick laid up in acid-resisting cement, or brick bottom covering and wood sides and ends framed in.

The tie rods on wood tanks should be given a good coating of chemical resistant paint before assembly and if the tank is not immediately put into use, the rods should be taken up tight every week for at least two months. Preferably, the tank should at least be filled with water.

Wood tanks which ordinarily are useful for many years, are often badly shredded and worn away along the front top edge by dragging work over that section. This is particularly true when processing is done in heavy baskets. A negligible investment is protecting this edge with a piece of form bent sheet lead, or a channel iron will considerably prolong the life and effectiveness of the tank.

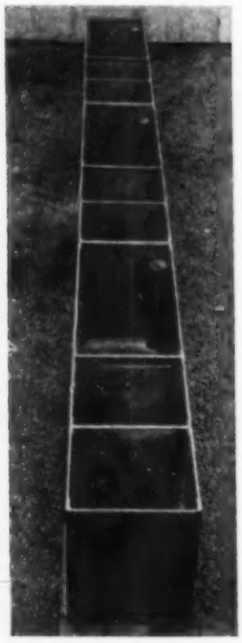


Fig. 4. An all lead-lined tank of 9 compartments with solid lead sheet partitions, dam type overflow, lead overflow pipe and drain outlets.

(Courtesy Storts Welding Co., Meriden, Conn.)

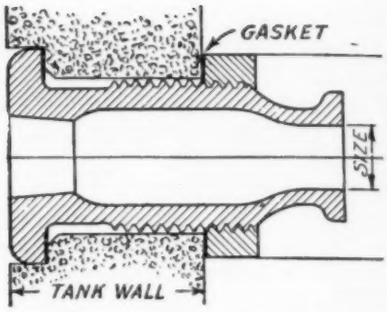


Fig. 5. Drawing illustrating how outlets are fastened to the tank.

(Courtesy the Hauser-Stander Tank Co., Cincinnati, O.)

Iron and Steel Tanks

Iron and steel tanks are most generally employed to advantage with hot or cold alkaline solutions. While sodium cyanide dip solutions will not affect steel tanks adversely, it might be advisable to use these solutions in rubber or asphalt lined tanks, since there is a possibility of forming objectionable colloid stains particularly when current is used.

These tanks present the advantages of strength, resistance to severe service, possibility of direct heating if desired, flexibility of design, and compatibility with any type of lining. Obviously such tanks considerably increase the floor load and may be subject to considerable external corrosion unless suitably maintained. Likewise, stray currents and short circuits are not uncommon with such equipment.

Specifically, plain steel tanks are usable for cyanide zinc, cyanide copper, cadmium, brass, silver and alkaline tin plating solutions, also alkali cleaners. The various linings for steel tanks also permit their almost general application.

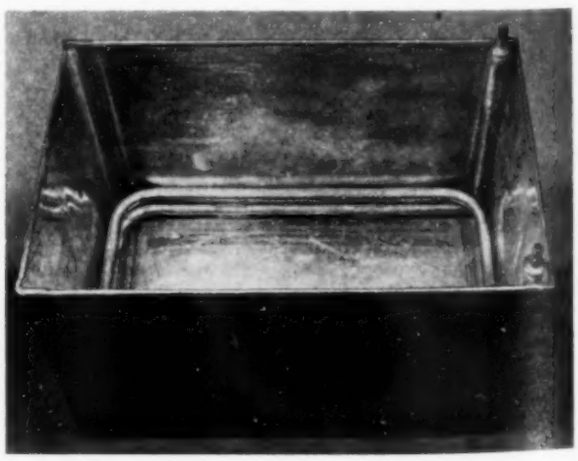


Fig. 6. A lead-lined hot water tank and coil of 6% antimony-tellurium lead.

(Courtesy Storts Welding Co., Meriden, Conn.)

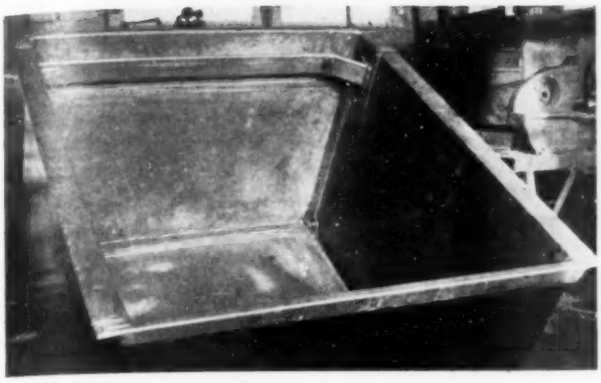


Fig. 7. Tank showing ways of incorporating dam type overflow and side or end drain outlets in lead-lined tanks.

(Courtesy Storts Welding Co., Meriden, Conn.)

At the present time the advantage of using the high purity sheet iron is being more fully realized. This material is more corrosion resistant than the steel sheet formerly used and is less susceptible to failure along form bent corners. In the past, most large tanks are riveted and in the better instances, caulked while all welded construction was regarded with suspicion. However, today, welded construction has come into its own with practically all modern tanks being completely welded. All joints should be double welded and all corners should be welded inside and outside for the purpose of eliminating joint fissures and crevices, usually present in single welded types of joints, in which corrosive elements readily accumulate and which, when so pocketed, cause accelerated rates of corrosion and deterioration.

It is generally permissible to use 12 gauge sheet for tank capacities up to 100 gal.; for capacities up to 500 gal., 10 gauge stock is recommended; and for larger than 500 gal., 7 or 8 gauge sheet must be used. Tanks up to 100 gal. capacity should have their top edges turned over to make a 90° angle. In heavy gauges, it is more convenient to weld either angle or channel iron around the top. It is usually advisable and many times necessary to provide means of preventing the side walls of large tanks from bulging. When permissible, a piece of channel iron may have its ends welded flush with the top, and to the opposite walls. Tee or angle iron welded in a vertical position may be employed to raise the tie bar some distance above the top of the tank to give an unobstructed solution surface. When it is desired to have a completely clear area above the tank, "U" braces may be used which will run down the sides in opposing positions and be rigidly welded to a bottom tie beam or one of the most practical and economical methods of supporting bulge load considerations on long tanks and tanks of depths of more than 36", is the use of girth angles or channel members located on the outside of the side and end plates at a point one third of the dimension from bottom edge to top edge of tank. Angles or channels for this purpose are continuous welded at four corners of tank to furnish a continuous surrounding framework and are tack welded to side and end plates.

Stoneware Tanks

Comprehensive and successful development of ceramic materials has placed chemical stoneware equipment in an excellent competitive position. These tanks which resemble porcelain but are stronger, are used extensively for bright dips where their characteristic of preventing contamination is fully appreciated. By virtue of their excellent chemical resistance, these tanks function well with all acids in all concentrations at temperatures up to 212° C. Hydrofluoric acid is the only exception. This type of equipment is also excellent for gold solutions, oxidizing solutions and cyanide dips. Stoneware being a silicious material may be slightly attacked by strong alkali solutions.

Circular tanks of this material may be obtained in capacities up to 500 gals. and rectangular tanks in capacities up to 300 gals. Larger sizes may be obtained, but the manufacturer should be consulted since many times it becomes more economical to use steel, wood, or concrete tanks lined with acid resistant brick. It should always be kept in mind that it is economically advantageous to choose standard equipment whenever possible.

When the solutions being used in such equipment tend to warm up, these tanks are generally set in other tanks filled with running cold water to facilitate keeping the temperature down. Conversely, if it is desired to slightly warm the solutions, the water in the surrounding tank may be heated, however, due to the low thermal conductivity there is considerable waste of heat energy. It is more desirable and for higher temperatures a necessity, to heat the solutions with one of the various types of immersion heaters. As a final word regarding the use of stoneware tanks surrounded by water, it should be noted that this procedure is an excellent factor of safety against accidental breakage.

Chemical stoneware should not be used under conditions subject to abrupt temperature changes unless it is possible to provide an even heating or cooling to practically the entire apparatus. Generally, operating temperatures should not exceed 212° F. When temperatures in excess of this value are desired, it is possible to obtain, at higher cost, stoneware especially formulated and processed for such applications. In such cases, it is advisable that the manufacturer be informed concerning conditions pertinent to the contemplated application. Circular tanks are generally more suitable for the handling of high temperatures and thermal shocks than are rectangular tanks. Properly made stoneware should be non-porous and completely vitrified throughout the entire mass, thus rendering it acid and alkali proof. The belief is common that stoneware in order to possess chemical resistant properties must be glazed. This is entirely erroneous since this material functions equally well in either the glazed or unglazed condition. Glazing is performed primarily to improve the appearance and to facilitate cleaning. Tanks made of this material should generally be given full bottom support.

Special Compositions

Improved molding technique and formulation of plastics has made it possible to obtain rectangular and cylindrical tanks molded from a mixture of acid washed asbestos and phenol-formaldyhyde resin. These tanks possess excellent strength, toughness, and durability. The insulating properties of this material diminish the risk

of short circuits and stray currents when used for electrolytic purposes.

The method of fabrication lends itself to the production of complicated shapes without excessive increase in cost. Rapid changes in temperature are not serious and operating temperatures up to 265° F. may be employed without deleterious effects. A low coefficient of heat transfer is a factor in the conservation of heat energy.

These tanks must be given full bottom support and, with the exception of the smaller units, the sides are prevented from undue bulging by several horizontal steel ribs running completely around the tanks and rigidly tied together.

Rectangular tanks are obtainable in sizes from 6″ x 6″ x 6″ up to 9′6″ long and 6′ wide x 6′ deep as single units. Larger tanks are possible by bolting together several units. A variation in any one or all dimensions may be obtained in steps of 6″. Cylindrical tanks may be obtained in sizes from 10″ to 9′ in diameter and up to 13′ in depth. No reinforcing bands are necessary until a depth of 16″ is exceeded, then one band per foot of depth is generally required. The larger sizes are additionally reinforced with vertical wood staves 1½″ x 3″ on 6″ centers.

Since these tanks resist hydrochloric acid, sulphuric acid up to 50%, and most salt solutions, they may be safely used for acid dips and plating solutions. A special material with a carbonaceous filler is available for handling hydrofluoric acid, but has somewhat lower physical properties than the first mentioned material. Tanks made of this material are not satisfactory for alkaline solutions or oxidizing solutions such as nitric and chromic acids.

Hard rubber tanks having chemical properties as subsequently discussed under rubber lined tanks, have been made in lengths up to 15′ and are operating satisfactorily. However, lined steel tanks are generally favored when this material is considered, because of the added strength.

Lead Lined Tanks

Lead lined tanks are widely used for acid solutions the exceptions being cold and hot nitric, cold concentrated hydrochloric, and hot dilute hydrochloric acid. Tanks lined with this material are satisfactory for the common acid plating baths such as acid copper, acid zinc, chromium and some bright nickel solutions. It is

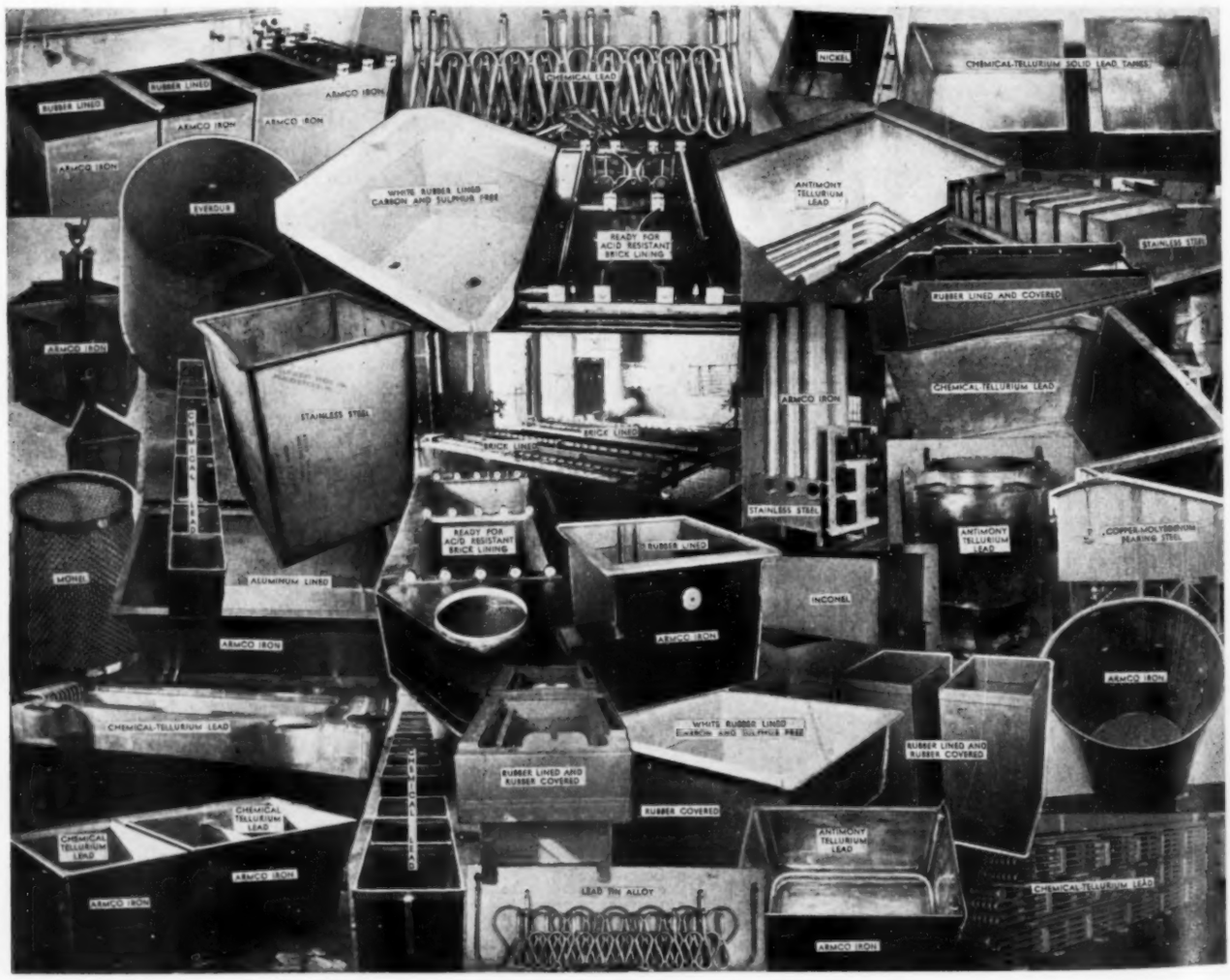


Fig. 8. Composite photograph showing various types of tanks with materials used in making them, indicated. (Courtesy Storts Welding Co., Meriden, Conn.)

not advisable to use such a lining for caustic or certain organic acid solutions since these chemicals attack the lining.

Lead linings may be applied to either steel or wood tanks but in any case, it is essential that the lining be brought completely up to and over the edge of the tank to insure good support. Unless a good support is provided, the lining may sag due to its own weight. In special cases, it is possible to obtain equipment with the lead bonded to the steel. The advantages claimed are better heat transfer and less danger of buckling troubles due to differences in coefficients of expansion. Until quite recently, only two types of lead sheet were available for use as lining material, namely chemical or soft lead (pure) and hard or antimonial lead (6% Sb). The alloyed lead being hardened by the addition of antimony is considerably stiffer than the pure variety and since it "carries" itself better has been generally preferred. Both of the above grades are now available with a very small per cent of tellurium added. The addition of this element prevents grain growth and a very fine grained sheet is obtained. Indications are that improved chemical resistance may be expected of this material. Lead sheet is available in 6, 8, and 10 pound gauges, choice being governed by the severity of the service contemplated.

Rubber Linings

Tanks lined with rubber are enjoying more and more widespread use due to the excellent chemical resistant properties of rubber. This type of lining will resist sulphuric acid up to 50° Be, hydrochloric in all concentrations, hydrofluoric, acetic, and phosphoric acids. Nitric acid is resisted in concentrations up to 16° Be but there should be reasonable assurances that solution control is reliable enough to prevent the concentration exceeding this value. Acid plating solutions are handled satisfactorily, chromium plating solution being the only exception. Caustic soda and potash solutions are also permissible. Unfortunately strong oxidizing agents such as hot sulphuric acid (over 50%), concentrated nitric acid, and chromic acid will destroy rubber linings. Most solvents and oils will soften rubber or disperse it. When pickling inhibitors are used they should be carefully checked since some of these materials exert effects similar to oils. The maximum temperature permissible is 150° F., however by consulting the manufacturer it may be possible to obtain compounds which will withstand temperatures up to 200° F.

Since the sheet rubber used is impervious, these tanks, if thoroughly cleaned and rinsed, may be changed from

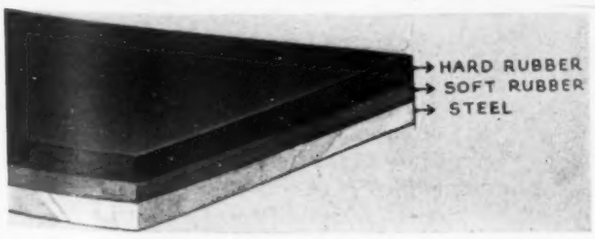


Fig. 9. Drawing illustrating patented method of bonding hard rubber to steel using an intermediate coating of soft rubber.
(Courtesy American Hard Rubber Co., New York)

Fig. 10. Automatic nickel plating unit with rubber-lined tank.
(Courtesy American Hard Rubber Co., New York)

one solution to another without danger. On occasion, otherwise perfect linings have failed because of faulty seams, particularly when wetting agents were present. This has now been eliminated by the availability of seamless linings. Rubber linings, because of the dielectric properties of the material, effectively reduce stray currents and short circuits to a minimum. These linings may be repaired either in place or at the factory when punctured. Due to the excellent bonding of the rubber, attack is localized to the area exposed when the lining is ruptured.

Several general types of linings are available such as soft, intermediate, hard, and various combinations of each. For the most part, the difference is mainly due to the sulphur content of the compound, it being higher in the harder compounds. It is also possible to obtain sulphur free compounds which is a very important and necessary consideration when the lining is to be used for bright nickel solutions. Advantages may be claimed for each type of lining which will render it suitable for particular applications. Soft linings due to the obvious flexibility of the material are suited to more rapid temperature fluctuations than hard rubber linings. On the other hand, hard rubber is somewhat more resistant to acids at high temperatures, to solvents, and to oils. Soft rubber offers somewhat better resistance to abrasive action. When it is desired to take advantage of the properties of both materials, the combined types are available. We may obtain a hard lining which has been backed up with a compound of intermediate properties, in other words, one with sufficient flexibility to act as a buffer between the wide differences in coefficients of expansion and with sufficient hardness to give ample support to the hard rubber lining when it is given a mechanical shock. An excellent all purpose lining is made possible by "sandwiching" hard and soft rubber, the hard rubber being interposed between layers of soft rubber. Provisions are made for the expansion and contraction of the hard rubber by making discontinuous lapped joints in this layer.

When there is danger of heavy parts falling on or bumping the lining it may prove economical in the end to line the tank with wood or brick.

Enameled Tanks

This type of lining, being a form of glass, has practically the same corrosion resistant properties as stoneware combined with the strength of steel. Since a good coating is designed with practically the same coefficient of expansion as steel, more rapid fluctuations of temperature are permissible with enameled tanks than with stoneware tanks. Unfortunately this type of coating may chip if severely shocked, and this probably in part explains why it has not been as widely adopted in the plating industry as it has in the chemical industries. As indicated above, these tanks are possible of the same applications as are stoneware tanks with the possible exception of strong alkali solutions which, of course, will attack any common form of glass.

Vitreous Brick Linings

Although it is possible to construct small tanks using these bricks alone, more frequently, they are used to line either wood, metal, lined metal, or concrete tanks because of the excellent chemical and mechanical protection they afford.

The properties and possible applications of this type of lining are practically the same as for chemical stoneware. This type of lining will give long and satisfactory service when used for chromium plating solutions. Before using a new brick lined tank for such a solution, it should be swabbed twice with chromic acid solution. This will impart a permanent set to the silicate cement and take care of any slight amount of soluble chromates formed. After swabbing, the tank should be cleaned and rinsed, then filled with the plating solution.

When installing acid proof brick linings, it is highly important that provision be made for expansion of the lining. Non-rigid horizontal and vertical joints are employed for this purpose. These joints obviously must be acid resistant and water tight, and wherever possible the "key" should not be broken. This may be accomplished by cementing small panels of rubber to the bricks at the joint.

Cements are available, which if properly formulated, are quite chemical resistant and in strength may exceed that of Portland cement. They are generally compounded of one of the following: sodium silicate, asphalt, plasticized sulphur, or synthetic resins. All except the plasticized sulphur type are handled in a manner similar to that used in ordinary masonry. The difference being mainly that the mortar is mixed in smaller batches, the brick evenly coated with mortar, and excess mortar, is squeezed out of the joints to give practically brick-to-brick points. Plasticized sulphur cements are heated to the proper pouring temperature and flowed into the joints. In this method, the joints are maintained before filling by the use of spacing blocks made of the solidified cement. A form is held against each course of brick, as it is filled, to retain the cement until solidification has taken place. This type of cement gives excellent performance at temperatures up to 200° F. All of these cements are susceptible to attack by strong alkalis, the plasticized sulphur and synthetic resin type have poor resistance against strong nitric and chromic acids.

Since it is not always possible to be sure that every joint in a lining is perfect in so far as being impervious is concerned, it is considered advisable to line the retaining tank. Rubber and lead lined tanks are no problem, the brick work being placed directly against the lining. In the case of steel tanks, the inside surfaces may be given several coats of a good asphaltic or rubber paint. For more reliable service, two layers of asphalt impregnated cloth membrane or asbestos roofing paper should be cemented to the entire inside surface using one of the various pitches, asphalts, or asphalt-rubber compounds available for this type of work. The same procedure should be followed for concrete tanks and should be performed on the outside as well. However, concrete tanks are not entirely satisfactory where severe corrosive conditions exist, unless more thoroughly protected.

Recent improvements in cements and technique have made it possible to construct large tanks entirely of brick at a lower initial cost than the rubber lined-brick sheathed type of construction, but special engineering consideration is required.

While not of the same chemical nature as vitreous brick, it might be well, while discussing such linings, to consider carbon brick linings. Carbon brick may be obtained, which when laid up with jointing compounds composed of carbon and plasticized sulphur or a synthetic resin, give highly satisfactory service for all concentrations of hydrofluoric acid. The plasticized sulphur compound is satisfactory up to temperatures of 200° F., above this temperature, up to 330° F., the synthetic is more satisfactory. For mixtures of hydrofluoric acid and nitric acid up to 30%, the carbon brick lining laid up with the modified plasticized sulphur compound is most satisfactory.

Synthetic and Other Organic Coatings

The increasing demands for materials capable of withstanding strong alkalis and oxidizing agents have resulted in the production of a wide variety of synthetic materials. Most of these are resins in condition suitable for either brushing or trowelling onto the walls of tanks. Some are available in sheet form and are applied with an adhesive and heat to the tank surfaces, being done either in place or at the factory. Most of these synthetic materials possess excellent resistance to oils.

In addition to the synthetic materials, there are available a number of asphalt and rubber paints, which when properly applied, materially increase the life of the equipment. Such materials fulfill a long felt need in the field of maintenance.

Clad Metal Tanks

Stainless steel and nickel clad steels offer means of obtaining the corrosion resistance of the semi-noble metals at a cost approximately 75% of that of the regular sheet. Such tanks are highly desirable when it is absolutely essential to prevent contamination of rinse waters by the container. Coatings averaging 10% or 20% of the total thickness of sheet are available but the heavier coating is preferred for welding. There is some danger of burning through or seriously depleting the coating when the lighter clad sheet is used.

Los Angeles Branch of A. E. S. Holds Seventh Annual Meeting

By Fred A. Herr

Honored by the presence for the first time at any of its affairs of Dr. William Blum, chemist of the National Bureau of Standards, Washington, D. C., the Seventh Annual Educational Session of Los Angeles Chapter at Hollywood Roosevelt Hotel on March 30 was unquestionably the most successful in the chapter's history.

From the standpoint of attendance as well as quality of speeches, extent of manufacturing exhibits and entertainment at the banquet, the session won the unqualified praise of the 125 chapter members and visitors at the two business meetings and of the 200-odd ladies and gentlemen who made merry till nearly 2 a.m. at the banquet and dance.

Morning and afternoon business meetings were held in the Blossom Room of the hotel, which had just been newly decorated in Hawaiian motif. Conveniently located in an adjoining room were the displays of some 30 local and out-of-town electroplating firms and products manufacturers. Many of the articles on exhibit were donations which were raffled off amidst much hilarity at the banquet.

Dr. Wm. Blum,
who presented reports on numerous works at the Bureau of Standards to the Los Angeles Branch.

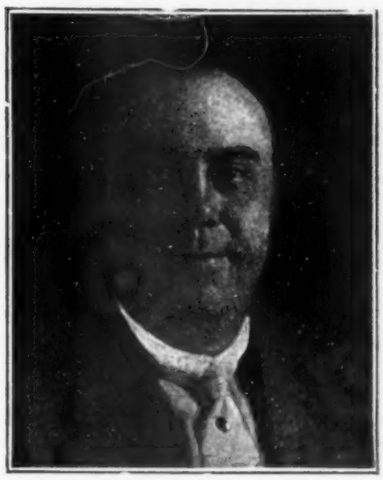
The business sessions were notable for their dispatch and close adherence to time schedule. The morning session opened at 10 a.m. with Chapter President *Ray Bray* delivering a suitably brief welcoming address and introducing Librarian *Emmet R. Holman*, chairman of the sessions.

Conscious of the eagerness with which the audience awaited the appearance of the principal speaker, Mr. Holman, without further preliminaries, introduced Dr. Blum. Dr. Blum's last visit to southern California had been some 15 years ago, prior to the formation of the Los Angeles Chapter. Some of those present had heard him speak at a special chapter meeting at Hotel Roosevelt on March 27, but most of them had never been privileged to hear the man whose book, "Principles of Electroplating and Electroforming," which he co-authored with George B. Hogaboom, and other published writings literally are textbooks of the electroplating profession. The appearance of the tall, distinguished looking scientist was greeted by sustained applause.

Dr. Blum's subject at the morning session was "A Summary of the Researches on Plating at the National Bureau of Standards." The salient points were illustrated with a series of illuminated slides. Much of his talk dealt with researches that had been made, or are being made, in spotting out; throwing or covering power; chromium plate measurement; porosity of chromium plating with regard to tendency for cracking; current distribution and current relations around articles of various shapes; plate thickness versus porosity; and tests being made by The Silver Producers' fellows to find increased use of silver in industry. He concluded with a series of slides illustrating the part the electrochemistry department of the Bureau of Standards plays in co-operating with the U. S. Mint in research dealing with the electrolytic processes involved in preparing plates for printing currency.

A short "Question and Answer" period followed Dr. Blum's address. After this, Chairman Holman introduced visitors from other chapters. Among those presented were:

Frank J. Hanlon, Chicago Branch, who had represented Los Angeles Branch by proxy at the 1939 national convention. Mr. Hanlon called attention to the fact that delegates to conventions are too apt to neglect to include in their reports to home chapters mention of the visits to industrial plants, which usually form part of the convention program. He urged that such reports, in the future, be made a formal part of the delegates' general report.



Frank J. Hanlon.
Mr. Hanlon is a member of the Chicago Branch and attended the Convention with Oscar E. Servis, also of the Chicago Branch.

Oscar E. Servis, Chicago, who said: "I have been overwhelmed with hospitality. I have renewed acquaintances with many old friends whom I had not seen for years, and as I meet each one of them, I come to the conclusion that one of the priceless assets of such gatherings as this, is the opportunity it affords for turning back the pages of time and putting us in intimate contact again with our friends of yesteryear."

Other visitors introduced at this time were *Florence M. Shelley*, instructor of the electrochemistry class at Los Angeles Polytechnic High School; *Joe LeVoy* of the San Francisco Branch, L. H. Butcher Co.; and *G. W. Gerisk* and *C. R. McDonald* of the Schlage Lock Co., San Francisco.

At this point, Program Committee Chairman *E. L. Lamoureux* read a message of greeting sent from New Britain, Conn., by *George B. Hogaboom*:

"Please extend my greetings to the members and guests of Los Angeles Branch in session at their annual meeting. I recall with a great deal of pleasure the warm welcome given Mrs. Hogaboom and myself and our memories are crowded with the many courtesies received while in Los Angeles, even to the gambling ship and the sea-sick mariner. The attention given to the story of electroplating I offered was a distinct compliment and it is a real regret not to be able to be with you all again.

Don M. Bedwell.
President-elect of the Los Angeles Branch and General Chairman of the 7th Annual Meeting.

"May the efforts of you and your associates be crowned with greater success than ever. With the very best wishes and our thanks for the opportunity of knowing Los Angeles members in person, I am sincerely yours,

George B. Hogaboom."

For the first time at any of the chapter's annual sessions, electric recordings of all speeches and open forum discussions were made. *Gaston D. Henshaw* of the Holly-

wood Music Co., technician in charge of the recording apparatus, pleasantly surprised Dr. Blum by playing back his entire speech within five minutes after he had finished talking.

"The speakers," Dr. Blum remarked drolly, "had better watch their phraseology. With every word being recorded for posterity, the speakers who are 'reminded of a story' will have to keep one eye on the audience and the other on the recording machine."

At noon, Dr. Blum was guest of honor at a luncheon at the Hollywood Athletic Club, at which *Roger Sundmark*, manager Plating Supply Division of Kelite Products, Inc., served as host. Present were *E. L. Lamoureux, M. D. Rynkofs, Don Bedwell, F. A. Maurer, Frank J. Hanlon, Gilbert Extale, Harold Coombs, Bruno Schindler, Joseph F. Hart, Walton Sundmark, J. H. Williams* and *Eaton Elliott*.

The afternoon session opened at 1:30 p.m., with an address by *F. A. Maurer*, research chemist, General Electric Co., Ontario, Calif., on "Bright Nickel Plating in Full Automatic Equipment."

Other speakers at this session were *Dr. T. K. Cleveland*, of the San Francisco Division, Philadelphia Quartz Co., who talked on "Principles of Detergency," and amplified his discussion with test-tube demonstrations of the various reactions of detergents; *William Broughton*, Morris P. Kirk and Sons Co., Los Angeles, whose subject was "Current Practice in Plating Alloy Die Castings," and *Dr. Blum*.

Dr. Blum's second address of the day dealt with "Specifications for Electroplated Coatings." He said that, in his opinion, the most important single factor that will determine the future of the electroplating industry is the ability to produce surfaces on which the coating can be applied in proper manner.

A Question Box period, which formed the last business item on the program, brought forth a number of interesting queries pertaining to the subjects of the afternoon talks, which were answered, respectively, by Drs. Blum and Cleveland and Mr. Maurer.

Don Bedwell served as master of ceremonies at the banquet in the evening, which, to the satisfaction of every one present, was absolutely devoid of formal speeches. Tables, arranged around a center dance floor, were set on slightly raised platforms in an atmosphere of artificial palms, banana trees and other Hawaiian decorative properties, which placed the diners in a receptive mood for the hula-hula dancers and other acts of the floor show.

The apex of hilarity at the banquet was reached during the drawing for door prizes. Each ticket was numbered and entitled the possessor to one "crack" at the 80 or more prizes. The list of prizes included lampshades, desk sets, electric clocks and irons, kitchen utensils, table lamps, chairs, boxes, cans and cartons of plating shop material. Naturally, the winning of a prosaic can of lacquer by a pretty little lady was the cause for chagrin on her part and good-natured boos on the part of her table companions. Friendly jeers greeted the disappointed groans of six young women each of who won—of all things!—a can of cleaning fluid.

Secretary *Ray Solivan* and Mrs. *Carl C. McClaren*, who supervised the drawing of numbers out of a rubber-insulated acid bucket, were subjected to loud cries of "It's a fake! Call the Dies Committee!", as one beautiful young lady in evening gown won a brass door knob, while *F. A. Maurer* of Ontario, Calif., walked off with a handsome, chromium plated chair.

Oscar E. Servis, genial Chicago visitor, won a can of lacquer and sundry boxes of scouring powder. He was so delighted at out-drawing his friend and traveling companion, *Frank J. Hanlon*, that he dropped a box and spilled powder all over the dance floor.

The only winner at the table presided over by *Tom F. McGuire*, of the Los Angeles Branch of the Maas & Waldstein Co., was Tom F. himself. He won one of the six cans of lacquer his firm had donated.

"Huh," grunted Tom grinningly. "I'll just put this can back in stock."

A gallon can of the same lacquer was won by *Frank Faeth*, seated at an adjoining table.

"Hey, Tom," cried Faeth. "Cancel that order for lacquer I gave your salesman this morning. I got a can now."

Dancing by young and old continued till nearly two a.m., with youngsters as well as oldsters participating. Dr. and Mrs. Blum claimed they had never before danced at an A.E.S. affair, but the spirit of the evening affected them to such an extent that they were seen among the terpsichoreans no less than three times. And one of the dances had all the earmarks of a rhumba. Mrs. Blum had not seen her brother, *Ernest M. Baylis*, Los Angeles realtor, for more than 20 years, and it was a pleasure to see brother and sister "stepping it out together" on the dance floor.

A smiling on-looker from the sidelines was *Mrs. E. L. Lamoureux*, wife of the popular "Ernie" Lamoureux. She had been ill for a week preceding the banquet, but fortunately recovered in time to join her husband and friends at the table of honor on banquet night.

Members of the committee which arranged the Educational Session and preliminary program consisted of *Don Bedwell*, Chairman; Chapter President *Ray Bray*; Secretary *Ray Solivan*; Librarian *E. R. Holman*; *Ernest Lamoureux, E. C. Thornton* and *Earl Coffin* of the Board of Managers; *Harold Kroeschke, William Vensel, M. D. Rynkofs. C. C. McClaren, Bruno Schindler* and *D. E. Eldred*.

Firms which maintained booths and contributed one or more prizes included the following:

Cannon Electric Co.; Trophy Craft; Lawson Time, Inc.; Weiser Manufacturing Co.; Virtue Brothers; S. & M. Lamp Co.; Oakite Products Co.; Southern California Plating Co.; M. R. Kenny Light Co.; Dazey Manufacturing Co.; Trojan Lacquer Co.; Van Woert Manufacturing Co.; Union Die Casting Co.; Chief Products Co.; Morris P. Kirk and Sons; Repcall Brass Manufacturing Co.; General Electric Co.; Maas & Waldstein Co.; California Lacquer Co.; Albert Lamp & Shade Co.; Dodge, Inc.; Public Service Brass Co.; Solar Lighting Fixture Co.; New Jersey Zinc Sales Co.; Turco Products, Inc.; Latex Seamless Products Co.; Hallenscheid & McDonald; Detroit Rex Products Co., and Kelite Products Co.

A special meeting of the chapter was held at Hotel Rosslyn on the night of March 27 to hear Dr. Blum talk on "Methods of Testing Electroplated Coatings." Dinner, with the ladies present, began at 6:30 p.m., with the business session opening at 8 p.m. Guests of honor were *Dr. and Mrs. Blum, Mr. and Mrs. Oscar Servis* and *Mr. and Mrs. Frank J. Hanlon*. During the business session, the visiting ladies were guests of *Mrs. Rynkofs, Mrs. Coffin* and wives of other chapter members at a downtown theatre party.

Other pre-convention activity included:

A trip to Ontario, Calif., on Thursday, March 28, where Dr. and Mrs. Blum, Mr. and Mrs. Servis and their "chauffeur" E. R. Holman, were guests of F. A. Maurer, research chemist of the General Electric Co.'s Ontario plant. Luncheon was served at noon. In the afternoon, while the men made a tour of the plant, the ladies were entertained by Mrs. Maurer on an automobile ride through the orange district and into the foothills of the San Gabriel Mountains.

On Friday, March 29, Dr. and Mrs. Blum visited the Naval Air Station at San Diego and the testing station of the American Society for Testing Materials at La Jolla, Calif. Dr. Blum subsequently told a representative of METAL INDUSTRY that he was surprised to find conditions at La Jolla much more corrosive than at Key West, Fla., site of another testing station.

"This fog has a decided bearing on west coast plating problems," he said. "I had always thought of California as a dry climate. The prevalent fog brings up conditions that I had not considered, and there is no doubt that it has an effect on plating in this area."

At the Wednesday night meeting, Dr. Blum had stated that the chances of southern California being awarded a plate testing station of the National Bureau of Standards were remote unless climatic conditions there were such as would produce results unobtainable at present testing stations in New York City, Sandy Hook and Key West. Further discouragement was contained in his explanation that the plating test work of the Bureau was nearly completed and the setting up of other stations would largely result in duplicating work already accomplished.

His discovery of fog conditions at La Jolla, he admitted the following day, had changed his viewpoint somewhat. Conditions of climate and weather, he asserted, are quite different on the west coast, and would undoubtedly yield some results not obtainable on the Atlantic Coast.

Galvanizers Committee Holds Successful Meeting at Pittsburgh

An unexpectedly large attendance at the seventh meeting of The Galvanizers Committee, held at Pittsburgh, April 11 and 12, served to break all former records. Among the delegates were representatives from twenty member companies, including two Canadian producers of galvanized sheets.

On the first day of the meeting, buses carried the delegates from Pittsburgh to Steubenville and Weirton, where inspections were made of the sheet mills and galvanizing shops of the Wheeling Steel Corporation at Steubenville and the Weirton Steel Company at Weirton. At noon they were welcomed at the Steubenville Country Club by *William H. Warren*, General Manager of the Steubenville Works, and the "Singing Millmen". Following the Weirton visit, the group returned to Pittsburgh for dinner and evening session, with *J. L. Schueler*, Continental Steel Corporation, presiding.

Friday morning's session under the chairmanship of *Robert H. Dibble*, Carnegie-Illinois Steel Corporation, opened with the presentation of a discussion on "X-Ray and Electron Diffraction Methods for Metallurgical Research" by *F. R. Morral*, research metallurgist, Continental Steel Corporation, this being followed by a second paper, "A Study of Tarnish on Galvanized Sheets by an Electron Diffraction Examination", by the same investigator. The following conclusions were drawn in the paper:

1. Freshly hot galvanized sheets have a transparent zinc oxide coating, formed during the cooling period of the coating from the molten state, on leaving the galvanizing pot, to the solid state, which zinc oxide coating film controls the corrosion resistance of the hot galvanized sheet.

2. This zinc oxide film, in the absence of carbon dioxide, but in presence of moisture, grows until it becomes visible as a yellow brown tarnish. In the presence of the proper amount of humidity and an excess of carbon dioxide, this zinc oxide film is changed to basic zinc carbonate, often called "white rust".

3. The transparent zinc oxide film on hot galvanized sheets, in the presence of humidity (or condensed water vapor in the case of sheets stacked in piles) and a deficiency of carbon dioxide, forms a blue cast tarnish which consists of varying amounts of zinc oxide and basic zinc carbonate.

4. The zinc oxide film on freshly galvanized sheets is as protective against atmospheric corrision as a zinc hydroxide film because both have about the same solubility.

5. White or grey fingerprint marks on hot galvanized sheets consist of an outside layer of basic zinc chloride. A reaction takes place rapidly between the chloride ions and the moisture in perspiration and the coating. An X-ray analysis of the sample shows that the layers beneath the zinc chloride consist of basic zinc carbonate and zinc.

These studies were made on freshly galvanized sheets, and samples of sheets covered with various degrees of tarnish and "white rust", using electron diffraction and X-ray methods.

The remainder of the morning session was given over to general discussion of selected subjects pertinent to galvanizing practice.

D. A. Russell, chief chemist, Youngstown Sheet and Tube Company, presided at the afternoon session, and introduced as the principal speaker, the galvanizing superintendent of his plant, *R. W. Hodil*, who gave a review of the "Third Coating Survey". This survey, made periodically by the members of the committee as a check on quality and practice in galvanizing operations indicates that there is no tendency to lighten the weight of zinc coatings on ordinary roofing sheets. Additional subjects for discussion at this session were chosen from a selected list.

At a meeting of the Committee's Governing Board on Friday, it was decided to hold the next regular gathering at Baltimore next November, the exact date to be decided upon. The present Governing Board, whose membership follows, will continue to serve until that time.

J. L. Schueler, Chairman, Continental Steel Corporation.
R. H. Dibble, Carnegie-Illinois Steel Corporation.
C. K. Lytle, Tennessee Coal, Iron & Railroad Company.
D. A. Russell, Youngstown Sheet & Tube Company.
J. J. Shuman, Jones & Laughlin Steel Corporation.
C. H. Steele, Steel Company of Canada, Ltd.
F. G. White, Granite City Steel Company.
E. V. Gent of the American Zinc Institute acts as Secretary-Treasurer.

Letters From Our Readers

Electrocleaning of Metals

In the March issue of METAL INDUSTRY, I noticed a reference made to the original electrocleaning process stating that it had been first developed in the Chicago locality. As I remember it, it was in 1908-09 and the place was Kalamazoo, Mich., by a plater named Harry Wolverton and one Doc Moyer, who all the old-timers will remember was then central representative of the Zucker, Levitt & Loeb Company, with headquarters in Detroit, and who worked with Harry Wolverton in introducing the process, Doc Moyer calling on all of the principal manufacturers who did electroplating and especially the stove factories.

Both Doc and Harry had a monopoly on the process and they made quite a bit of money introducing and installing the process. Doc told me himself that he made enough to purchase and operate his Model T Ford automobile with this process.

The solution which was first used for electrocleaning consisted of caustic potash and fine coke screenings. The solution was operated at boiling temperature and with as much electric current that was possible from the generator, which was either 6 or 12 volts on a three-pole machine. The idea of the coke screenings was that with a boiling solution and the electric current, they would cause agitation and the screenings were supposed to scour the material to be cleaned, which was cast and malleable iron.

After the process was introduced, there were quite a few platers who experimented and developed the process further, and it was not long before the coke was eliminated as it really did not scour the work. The boiling caustic potash solution was also very hard to control, for when it became too hot and the current was put on the work, the solution would boil over and the hydrogen created by the current caused fumes to fill the immediate locality of the cleaning tank, which were bad for the operator, as they affected the nose severely.

There were many concoctions created and put on the market to be used for electrocleaning. I will just mention a few. The General Platers' Supply Company of Cleveland, Ohio, put on one called "Electro Cleaner," which was a by-product of aluminum reduction.

The James H. Rhodes Company put one on the market called "Carls Ruhe"; the J B. Ford Company developed "Wyandotte" metal cleaner, and later the Oakley Chemical Company developed "Oakite", and then it seems that they were legion as every supply house had one of its own under a trade name.

As stated before, electrocleaning was first used by stove manufacturers, fire-place grates, all kinds of cast iron and malleable castings and steel work.

For brass and bronze work, there was more trouble getting a solution that would not tarnish the work. However, it was developed later.

The question was whether direct or reverse current should be used and there was

(*Concluded on page* 287)

PLATING AND FINISHING
FABRICATION — ASSEMBLING
METALLURGICAL — ROLLING
CASTING AND JOINING

SHOP PROBLEMS

Technical Advisors For May Issue

G. B. HOGABOOM, JR.
Consultant in Electroplating and Metal Finishing, Newark, N. J.

W. G. IMHOFF
President, Wallace G. Imhoff Co., Vineland, N. J.

PAUL A. OLDAM
E. Poeter & Co., Inc., Irvington, N. J.

JOSEPH P. SEXTON
Superintendent of Plating and Finishing Sargent & Company, New Haven, Conn.

When sending solutions for analysis please give following information: name and address; class of work being plated; kind of solution and volume; length, width and depth of tank; temperature of solution; current density, cleaning sequence and any other pertinent facts.

Rogers Gold Finish

Q. We would like to know how a Rogers gold finish is applied. We can locate no mention of this in the literature.

A. A Rogers gold finish has been used on chandelier and similar electrical fixtures possessing indentations or recessed parts. The articles are first plated in a brass solution that will yield a clean, smooth, bright deposit. The work is dried carefully to avoid staining and is then sprayed or dipped in clear lacquer. After the lacquer has dried, the work is dipped into an alcoholic solution containing gold dye, or the work is sprayed with the gold dye. The lacquer and gold dye can also be mixed and applied in one operation, but this technique does not give as uniform a finish as the first mentioned method. The work is allowed to dry further and then burnt umber or various desired shades of brown oil enamels are applied and the high spots relieved with turpentine.—P.A.O.

Matte Dipping of Brass

Q. We have been trying to duplicate the matte dipped finish, similar to the shell sent you. Will you please tell us how this finish can be duplicated?

A. One of the factors controlling the type finish obtained in matte dipping is the grain size of the brass. If the metal has been overannealed, a coarse matte will be had, if correctly annealed, a fine matte. The sample furnished appears to have been properly annealed.

Also, a low brass (70% copper, 30% zinc) matte dips better than a high brass. Sample appears to be low brass.

In matte dipping, no chloride should be present in the dip. Have you tried the formula on page 10 of the 1939 edition of the Plating & Finishing Guidebook? (Published by the METAL INDUSTRY.) That formula is:

Sulfuric acid	1 gal.
Nitric acid	1 "
Zinc oxide	2 lbs.

Use hot and keep free of water.

If finish is too coarse, add sulfuric acid. If too fine, add nitric acid.

After matte dipping, the bright dip should be one that will bring out the luster and therefore should not contain high nitric acid. The following is suggested:

Sulfuric acid	1 part by vol.
Nitric acid	1 "
Water	1 "

Add 1 fluid ounce of hydrochloric acid to each 5 gallons.—G.B.H., Jr.

Bright Brass Plating

Q. We are enclosing herewith four pieces of steel, one in the raw state, two others in the brass plated state and a finished lock part. We desire to put a finish on this polished steel similar to the finish on the lock part but do not seem to be able to get a bright finish from plating only and wonder if you are familiar with any brightener which could be used for this purpose. You will note that No. 2 sample was plated for 10 minutes and the other sample, No. 1, was plated for 5 minutes, which still shows the darkness of the steel through the plating. We do not have any trouble in putting bright nickel on similar parts and would like to do the same thing with brass if it is possible to do so.

A. Regarding the brass plating on the enclosed pieces, I am afraid it will be hard to produce a brass plate as bright as the finish shown on the lock cap by plating only. However, a bright finish can be obtained inexpensively by burnish rolling with steel balls after plating.

I took the liberty of plating the unplated piece of steel for a few minutes in a bath to which a bright-

ening agent has been added. No doubt, it is not the quality desired, but it is an improvement over the pieces that were plated by them.

The brightener used is made up by mixing about a pound of caustic soda and about 2½ oz. of powdered white arsenic oxide to a gallon of water. Have the water warm but not hot when mixing. This brightener should be added in a very small amount to the brass solution; it can be mixed with the ammonia when adding for color. Don't add over an ounce of the brightener to 100 gallons of plating solution at one time.—J.P.S.

Gold Plating on Britannia Metal

Q. We would like to know if there is a method of plating gold directly upon Britannia metal without using a preplate. In addition, is there a bright dip for Britannia?

A. The plating of Britannia metal with gold without the use of an intermediate deposit of, for example, brass or copper, is not common nor is it recommended. There are several reasons for this, among them being: (1) more gold is necessary to secure a desirable color; (2) the finish and lustre obtainable are not as satisfactory and it is often more difficult to secure deposits of equally satisfactory physical properties and adherence; (3) the gold tends to be absorbed eventually into the Britannia, with resulting impairment of the surface.

However, direct plating of gold on Britannia may be done if desired and the following two baths have been recommended for this purpose:

(1)

Neutral gold chloride, approximately	15 dwts.
Potassium cyanide, approximately	15 "
Neutral sodium sulfite, approximately	8 "
Disodium phosphate, approximately	2 ozs.
Water	to make 1 gallon
Temperature	150-160° F.
Current density	low—about 0.25 amps./sq. ft.

(2)

Gold chloride, approximately	4 dwts.
Potassium cyanide, approximately	4 "
Water	to make 1 gallon
Temperature	125° F.
Current density	about 0.5 amps./sq. ft.

In both cases, gold anodes should be used, in size preferably about one third of the cathode area. Formula 2 is an older solution. It operates at a cathode current efficiency of 85% and will deposit about 2 dwts. of gold on a sq. ft. at the above current density in one hour.

There appears to be no satisfactory bright dip for Britannia comparable to those for the copper alloys, for example, some "whitening" action may be obtained at times by immersion in a weak (about 2 oz./gal.) solution of caustic soda, kept warm. The time of immersion depends on the surface condition and excess immersion will have the reverse (a darkening) effect.—Research Electrochemist.

Spotty Hot Tinned Wire

Q. We are sending you four pieces of wire, two of which have been hot tin dipped and two pieces of raw wire. You will note small spots on the hot tin dipped wire, which show no tin at all. We are hot tin dipping wire with the following sequence of operations: (1) electric clean with reverse current at 6 volts; (2) rinse; (3) pickle 10 minutes in 40% muriatic acid at room temperature; (4) rinse; (5) dip in a flux solution and then tin. The above mentioned tinning operation is the same as that used on the two samples which show no tin spots. When we retin a second time, we get good results. Can you advise me what to do to obtain a good finish in the first tinning operation? The coating material consists of 75% tin and 25% lead.

A. The two pieces of raw wire before being hot dip tinned, were carefully examined, and appear to be a high quality raw product. There is no evidence anywhere in the raw base material of any defect which should be the cause of the uncoated spots as found in the two hot dipped tinned samples. The examination reveals that the black spots or uncoated spots, all occur on the one side of the wire and they all occur in a straight line on the one side. This evidence suggests that the spots may be caused by—dirty pulleys, grooves, notches, or whatever the wire rests upon when it is being drawn through the tin bath, and after it comes out of the tin bath. This dirt may consist of dried flux or like material that has lodged in the spot where the wire passes over, giving, of course, a black spot or uncoated spot, due to this flux or dirt. To remedy this cause, all places where the wire passes over might be examined, and just as a precaution, cleaned by brushing. If that is not suitable, use an acid wipe made of acid-soaked waste or other suitable wipe to remove such dirt, and make all rests where the wire passes over, absolutely clean.

Another cause might be in drying, if the wire is dried. The bottom of the wire would, of course, be hotter than the top, and perhaps becomes too dry, thus causing the flux to stick, which in turn will give the black uncoated spots. If the wire is not dried, then this cause would not apply.

The flux may be burned to dry, thus causing it to stick to the wire. This cause would also give black uncoated spots. The remedy here is to watch the character of the flux closer to see that it is always in good condition. It should never be allowed to become dry as dry flux always sticks to the base metal, thus preventing the metal from coating the surface properly. A close examination of the black spots seems to indicate that whatever the material is, it is a thin coating on top of the tin coating, suggesting that it might be a very thin layer of charred flux, or flux conditioner. When the black spot is scratched with a sharp edge, it can be scraped off, leaving a good tin coating below.

It might be that there are times when the liquid flux on the bath does not entirely cover the tin bath, causing the tin to oxidize and form a thin tin oxide skin. These pieces of tin skin are, of course, dragged out with the tin coating. The remedy for this cause would be to see that there is a heavy enough coating of flux over the tin bath surface to keep it entirely covered all the time.

The spots are not uncoated areas, but seem to be rather pieces of tin skin or like material that are in the tin bath, and are dragged on with the tin, and lodge on the tin coating. They are on top of the tin coating. The condition of the flux should be studied carefully to see if any of the above suggested causes give rise to these pieces of "black skin." The bath surface should also be studied to see that the flux fully covers it all the time.—W.I.

ELECTROPLATING DIGEST

SELECTED ABSTRACTS ON PLATING—FINISHING—RUST PROOFING—LACQUERING

Bright Copper Solution

A process for obtaining bright copper deposits is described in U. S. Patent No. 2,195,454. This patent is based on an application by Lawrence Greenspan assigned to Louis Weisberg, Inc. The solution used is not of the familiar acid sulphate or cyanide type generally used for copper plating. Instead, the copper is present in the form of a complex salt formed by interaction of copper sulphate with a suitable amine; certain agents are employed in addition to give brightness, and for other purposes.

The term amine is a familiar name applied to certain organic derivatives of ammonia. Many compounds belonging to this family are known and quite a few are commercially available. Attempts have previously been made to utilize amines in copper plating without any particular success. The chief difference between these solutions and the solution described in the patent is in the presence of the addition agents.

When ammonia is added gradually to a solution of copper sulphate, the effect is to produce a precipitate which redissolves when a sufficient excess of ammonia has been added. The behavior of copper sulphate solutions to which an amine is added is similar; the first result is the formation of a precipitate, which dissolves when an excess of amine has been added. The solution then contains a complex copper compound which gives it a deep blue, or sometimes a purplish, color.

Various commercially available amines may be used. An example given in the patent is diethylene triamine. The invention is based on the discovery that good, ductile, bright copper deposits can be obtained from solutions containing complex copper salts formed by interaction with amines,—for example, diethylene triamine, —providing the solution also contains suitable amounts of ammonium compounds such as ammonia and/or ammonium salts. In general, therefore, the solution may be said to contain copper sulphate, diethylene triamine, and ammonium sulphate, with or without some additional ammonia.

The concentration of the various ingredients may be subject to considerable variation providing they are kept within certain specified limits.

The solution is said to be suitable for operation over a wide range of temperatures and current densities. The recommended temperatures and current densities are between 120° and 140° F. and 40 to 50 amperes per square foot. However, it is stated that on articles not too complicated in shape, current densities up to 130 amperes per square foot have been used with good results.

The deposits obtained are uniformly bright over a wide range of current densities so that parts with deep recesses can be covered. The deposits are light in color. It is said that articles plated in this type of solution can be bent or twisted until the base metal fails without seriously damaging the deposit. The current efficiency is close to one hundred per cent, the copper being taken as in the divalent state.

In plating iron or steel parts, flashing in a cyanide copper solution is recommended. Flashing zinc base die castings is also recommended; otherwise blistering is sometimes encountered. Electrolytic rolled copper anodes may be used. The copper content of the solution is maintained from the anodes. If pitting is encountered, a wetting agent may be used to overcome it.

All ingredients in the solution can be controlled by straightforward chemical analysis.

The owners of the patent state that a test plant has been in commercial operation for more than a year, plating mainly zinc base die castings together with a lesser amount of steel. The die castings have generally been plated to a thickness of about 0.0003" in the bright copper, then transferred to bright nickel and finally to chromium, without buffing after any of these plating steps.

It is claimed that this solution has a considerable advantage over other available copper plating solutions as a foundation for bright nickel, because of its much greater brightness.

Copper deposits from this solution can be buffed easily, if desired, to cover imperfections or die marks in the base metal.

Barrel Tumbling Material

U. S. Patent No. 2,185,262, *J. Lupo, Jr., January* 2, 1940. The material consists of hard bony pellets, such as vegetable ivory, absorptive fibrous fragments and an abrasive material and lubricating and adhesive vehicles.

Proportions used are:

Metal articles	25%
Dry mixtures of vegetable ivory chips, abrasive and lubricant and adhesive	75%

Example:

Metal articles to be tumbled	25%
Abrasive compound	10%
Hard, bony pellets such as vegetable ivory chips, bone chips, synthetic resin chips or hard tree root chips	65%

The abrasive compound consists of 42% absorptive fibrous fragments such as hard wood, granulated sawdust, wood chips or leather fragments, 10% kerosene or equivalent light thin mineral oil, 20% abrasive such as 320-400 mesh pumice, emery or carborundum and 28% abrasive material and lubricating and adhesive vehicles. The last item consists of 19% hard fine abrasive such as pumice, emery or carborundum, 47% kerosene or equivalent light mineral oil, 23% adhesive such as tallow, degras, red oil, stearic acid, etc., 11% petrolatum or other heavy mineral oil. Various other formulas are given in this patent.

Etchant

U. S. Patent No. 2,177,751, *E. A. Sikorski, assignor to General Chemical Company, October* 31, 1939. An etching bath containing nitric acid and urea which reduces fuming, extends life and increases bite. The urea should be at least 0.3 parts by weight per 100 parts by weight of 100% nitric acid.

Example:

Nitric acid	9—10% or higher
Urea	0.32 parts by wt. to 100 parts of 100% nitric acid

Coloring Stainless Steel

U. S. Patent No. 2,172,353, *C. Batcheller, assignor to Allegheny Ludlum Steel Corporation—September* 12, 1939. Ornamental coloring of stainless steel containing 7% or more chromium by weight by immersion in a solution containing sulfuric acid and an oxidizing agent and etching inhibitor selected from the group consisting of vanadic acid, metavanadic acid and ammonium, potassium or sodium salts of same. The sulfuric acid must be sufficiently concentrated to dissolve the steel if used alone. Use at 185°—200°F.

Example:

Oxidizing agent and etching inhibitor	4—25 parts by weight
Sulfuric acid—1.84 sp. gr.	23—54 " " "
Water	35—64 " " "

For a deep adherent black immerse for 1 hour in:

Oxidizing agent and etching inhibitor	10—14 parts by weight
Sulfuric acid	36—50 " " "
Water	40—50 " " "

Low acid content increases time required and results in irridescence. High temperatures such as 250°-260°F. result in too rapid film formation and poor adherence. The metal is also attacked.

Post Scripts

Emanations from our Sleuth at Milwaukee

Ray Goodsell, our genial and well-liked national A.E.S. president, was very much in evidence both at the Educational Session and later at the dinner dance, helping greatly to run the affair off as smoothly as it did. The Milwaukee Branch is proud to be his home Branch.

+

Jack Geissman, Milwaukee Branch president and also president of the International Fellowship Club, is also getting to be a past master at putting over our Milwaukee A.E.S. functions, both as presiding officer and behind the scenes hustler.

+

Seems as though the Gold Dust Twins, *Walter Pinner* and *Turk* of McGean, really had the master of ceremonies worried during the floor show. They paraded back and forth in front of the stage so often (to the beat of the accommodating drummer) that the M.C. thought he was being picketed by the walking delegates of the platers' union—or thought the boys were having trouble finding that certain room.

+

Oscar Servis and *Frank Hanlon* had the boys all excited with rumors of a little escapade during their California trip. Speculation on what actually happened ran from being "caught alone with Greta Garbo" to being "thrown in the jug for climbing trees in the famous 'Cocoanut Grove'". However, Frank and Oscar were keeping very strict censorship about the whole thing, although promising to tell all very soon. Maybe the rascals can still show the younger platers a few tricks.

+

Nick De Caeseri of the Kohlers of bath tub and plumbing fame was very much in circulation, and could be seen waving his arms in heated discussion with his friends. Nick is nothing if not enthusiastic about his work. His hobby and chief joy in life outside of working hours is the raising of very beautiful flowers in the model Kohler community. We had the privilege of going through Nick's department last year, and were much impressed with the fine plant layout and expert polishing procedures in use there.

+

Bob Goodsell, loyal Milwaukee Branch member that he is, came all the way from Dubuque, Iowa, to attend the session. Bob has worked about a year at his new job with the A. Y. McDonald Co. in Dubuque.

+

This column understands that *Jake* ("Tiny" to you) *Hay* who was very much in "bloom" at the dinner dance was later laid out in state in one of the rooms upstairs with the "body" banked with many beautiful flowers. Too bad we didn't have a lily for the final touch!

+

Saw *Lyons* of the Meaker Company, who delivered that most excellent paper on cleaning of steel at the Chicago Educational Session. Ernie is a capable, yet modest individual who should go places in the industry.

+

Gus Soderberg's experiences with the patent office seemed to strike a responsive chord with many of the members. From what Gus says about the first patent application having all claims rejected, may not make us feel so badly when it happens to us next time. His remark about patent lawyers getting $75 a day, makes us feel we're in the wrong business!

+

Henry Bornitzke, able librarian of Milwaukee Branch, is to be congratulated for planning the fine Educational Session. Under Henry's guidance, Milwaukee Branch has jumped into national prominence by the consistently high calibre of these sessions. We appreciate the hard work necessary to accomplish this. Congratulations, Henry!

+

Met *Charlie Conley*, pleasant and able chairman of the National Convention at Dayton. Having gone through a national convention recently, we appreciate the tremendous amount of hard work necessary to put across this event. Lots of luck, Charlie.

+

Burt Daw, genial president of Lasalco, Inc., helped the M.C. during the magician's act. Undaunted by having a cloudburst of Schroeder Hotel silverware pulled from his pocket, he and partner sang a delightful off-key version of "Down by the Old Mill Stream". The boys stopped the show with that one.

Respectfully yours,
Red-Nosed Reporter.

+

F. A. Maurer of Ontario, Calif., probably felt like *Webb Knight* did at the Detroit banquet and *Jim Brady* at Washington, D. C. Maurer showed up in formal dinner attire (*E. W. Francis* called it "soup-and-fish") at Los Angeles Chapters' annual dinner. He stood out like a chromium plated door-knob in a box of rusted iron filings.

+

Frank J. Hanlon is quite proud of that testimonial watch which the A.E.S. presented him in 1930. At the Los Angeles banquet he kept comparing the movement of his watch with the "movement" of one of the hula-hula dancers in the floor show.

Some Fishing!—There are king, bonita and mackerel. The husky Adonis on the left is Ralph McCahan of Dupont Company, erstwhile sage of Thornwood, and the fellow sitting is Fred M. Carlson, president of the American Tinning & Galvanizing Co., Inc., Erie, Pa.

"She's certainly got a 20-jewel hip-movement," he remarked to *Frank Rushton.*

"Yeah, if she could only tell time," Rushton observed dryly, "You could carry her in your other vest pocket."

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The Fleeting Fame of Bert Sage (And Kay Kyser)

The March meeting of the Binghamton-Syracuse Branch of the A.E.S. held in Cortland, probably will be long remembered by *Bert Sage.* At this meeting was one *Bill Kennedy,* Supreme Secretary of the A.E.S. and also present was Bert all the way from Olean, New York.

After the meeting, Bro. Kennedy decided he would take a train leaving Binghamton at 3 A.M. for the Newark-New York affair, as Bert and yours truly were going to Binghamton after the meeting, we decided to take Bill along.

Arriving there we found a band and what a band, none other than the world famous (so Bert said) *Kay Kyser* with *Ishka Bibble* and all the rest except, alas, *Ginny Sims.* Mr. Kennedy being a very proper Supreme Secretary and New Englander was not too demonstrative but Bert, Good Lord he acted like a high school gal out for an autograph. Boy he hunted around and found the great Kay and gushed and gabbed with him like a long lost brother. Well, after that we went for the night to Bert's brother's house and of course the first thing Bert did, 3:30 A.M. mind you, was make the wife and sister-in-law get up so they could shake the hand that had shook the hand of the great Kay Kyser and here's where Bert's balloon burst. Bert's wife very dutifully shook the hand that etc. but the sister-in-law said, "who the heck is he?"

George Simmons.

+

Clinton Company's irrepressible *Rudy Hazucha* continues to make headlines in bowling. He recently took part in his 16th entry into the A.B.C. tournament. He turned in 701 as his part in the doubles on games of 257, 222 and 222. Some bowling, we calls it.

+

Is Baker of M. E. Baker Co., Boston spent his vacation recently in Havana, Cuba. I guess those blizzards and ice storms lately were too much for him.

Father and Son—Edward Faint of Mack Motors on the left and son Harold of Continental Roll & Steel Foundry Co., snapped at Fred Gumm's recent Open House.

Wing your Way to Dayton on the above TWA air liner. That's our Joan Trumbour and nephews who just gave their O.K. to the ship. Fly from New York to Dayton on the A.E.S. special Sunday afternoon plane in four and a half hours. Write J. T., Metal Industry, for your reservation.

Wing your Way to Dayton!

The Bridgeport Branch of the A.E.S. years ago had a member whom we shall call for the sake of anonymity, *James Protect.* Jim boasted of the U. S. record for holding the greatest number of jobs. At the most recent count, Jim claimed to have held 108 jobs in 30 years of plating.

Jim was working in a plant in California at the time when Battling Nelson and somebody else were to fight for the world's championship. Jim was lacking in cash and approached his boss for an advance on his salary so that he could attend the fight. The boss refused, so in desperation, Jim took the gold anodes from his gold plating solution and pawned them to get the desired cash. At night he had to turn in the anodes to the boss who locked them in the safe. That night the boss received what he thought were the regular gold anodes.

The next morning Jim's boss unlocked the safe and handed Jim the "gold" anodes. Jim said, "Them ain't gold they are nothing but gold plated brass anodes. If you want to get the real gold anodes, here's the pawn tickets. Anyway, I saw the fight."

Perhaps this was one reason why Jim started to hunt for his then 89th job.

+

Erve Frauenhof of the Price-Pfister Brass Manufacturing Co., Ltd., is certainly making it tough on the "Surprise Party Bloc" of Los Angeles Chapter.

There's a certain group in the chapter, all good fellows and friends of long standing, who delight in "throwing" surprise parties. They stage them for birthdays, wedding anniversaries, blessed events and other occasions; and sometimes for no reason at all except to have a party. The most recent one was the housewarming surprise staged in honor of *John Merigold* and wife.

And that's where Erve Frauenhof enters this story. Erve is building himself a new house. It was bruited about at the last meeting that he was putting up a sprawling California bungalow, with wide veranda and big living room—an ideal setting for a housewarming party.

"Just where is this new shack of yours, Erve?" asked *Clarence Thornton.*

"Out Highland Park way," said Erve, "where the mountains are nameless and the roads run God knows where. . . . Why?"

"No particular reason," said Thornton. "I just asked."

"Don't you believe him, Erve," *Max Goldman* cautioned. "Thornton and his gang probably have their eye on your new place for a surprise party."

Frauenhof grinned. "They'd have a time finding it, unless I guided them to my own surprise party. The house is out in the mountainous district near Occidental College. They used a corkscrew as a model for the streets. Some of 'em go straight up to the sky, turn around, twist backwards, and wind up at the edge of a cliff.

"Say," he concluded, "you men couldn't find the place if I put a neon sign and an airplane beacon on the roof. Let me know when you're planning on surprising me, and I'll guide you to the place."

+

"Amorphous metal postulation as a source of abortive prolixity."

M. D. Rynkofs of Los Angeles Chapter slipped M. I.'s representative a penciled note during a recent meeting, containing the above quotation, which Mr. Rynkofs said had appeared in the January issue of METAL INDUSTRY.

"Ask Walter Meyer what it is?" demanded Mr. Rynkofs with the air of a man who would like very much to know the answer.

+

Spring Stag Party

Place—Leacrest, Bob Leather's Farm, Bethlehem, Conn.

Time—Saturday, May 25, 1940 from one P.M. on.

Refreshments — Hamburgers, Hot Dogs, Beer, etc.

Trap Shooting—Exhibition and instructions with the latest type equipment. Shells and targets charged at cost.

Horseshoes, archery, baseball, quoits, badminton, etc.

Cost—$1.00.

Everyone in our industry is welcome.

+

Bill Chase has recently taken up his duties again at the Agate Lacquer Mfg. Company, after an illness. Best wishes for good health, Bill, we missed you at Waterbury.

+

Incidentally, we picked up many interesting news items at the Newark, Boston and Waterbury meetings. We hope to have them in the June issue.

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Dave X. Clarin and *Ed C. Rinker* of Oakite Products, Inc., are the only male members of Aunt Ella's Society. *Mrs. Chas. C. Conley* has recently announced that the second annual convention of the Aunt Ella's Society will be held Wednesday, June 12, at which time *George Morrow,* the old master of tricks, will entertain.

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Congratulations are in order to *Prof. F. C. Mathers* for his election to presidency of the Electrochemical Society, and to *Ed. Baker* and *George B. Hogaboom* for their election to vice-presidency; also to *Clayton Hoff* on his promotion to managership of the Electroplating Division of the Dupont company, and to *Floyd F. Oplinger,* to be assistant to Clayton.

Walter R. Meyer

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

Analytical Service

The Kocour Company, 4720 S. Christiana Ave., Chicago, Ill. have announced an analytical service for plating solutions, which requires a four-ounce sample, and a report is said to be sent quickly by air mail.

Nickel solution analysis consists of nickel, chlorides, boric acid, pH; cyanide copper analysis includes copper, free cyanide, carbonates, pH; acid copper analysis includes copper, sulfuric acid. These analyses are offered for $1.00 each.

Rochelle salt, copper, brass and chromium solutions are analyzed for $1.50 each.

New Copper Plating Process

A new process for obtaining bright copper deposits has been described in U. S. Patent No. 2,195,454, on application by Lawrence Greenspan, assigned to Louis Weisberg, Inc., 71 West 45th St., New York City. The solution utilizes complex amine salts of copper, together with an addition agent noticeably ammonium salts. The solution is said to be suitable for operation for a wide range of temperatures and current densities. The recommended temperature range being 120-140°F., and the current density 40-50 amp. per sq. ft. Current densities up to 130 amp. per sq. ft. have been used. The deposits are light in color, uniformally bright over a wide range of current densities, with current efficiency close to 100%. The bath is recommended particularly as a foundation for bright nickel. Further details regarding this process are given on page 274 in the Electroplating Digest.

Electroplating Silver by Brush Method

Announced by Rapid Electroplating Process, 1414 S. Wabash Ave., Chicago, this process consists in a new and more efficient undercoat with superior wetting qualities, as well as an improved plating compound by means of which silver platings of 0.0002 to 0.001 inches thickness can be quickly and economically applied by anyone without previous experience. These are combined in an inexpensive compact portable kit complete, ready for operation. Current is applied by transformer-rectifier or dry batteries.

Important uses in industrial and maintenance electrical fields are in the spot-application of adherent silver platings to busbars and all bolted, screwed or friction connections, high or low voltage circuits, where reduction of resistance and consequent improvement of conductivity are important. It is claimed that thinner, nonporous platings can be applied by the brush method than by any other method. Collateral uses are for silver plating worn spots or limited areas on silver or other white metal surfaces. Gold plating can also be applied with equal facility.

Brush set for electroplating silver.

Fundamentally, the process does not differ from ordinary commercial plating methods except that the liquid electrolyte is replaced by a highly-concentrated jelly-like compound which, owing to its consistency, can be picked up by the specially designed brush and applied to the desired surface. Quality is equal to best commercial plate of equal thickness.

Carboy Truck for Handling of Acids

A handy carboy truck made by the Barrett-Cravens Co., 3256 W. 30th St., Chicago, Ill, claims to minimize the hazard of transporting carboys, handling them from storage or truck to process faster, safer and easier.

Acid carboy truck.

These units have two arms which are spread open by means of a readily accessible pedal and which close against the crate housing the carboy when the pedal is released.

The arms lift against the cleats on either side of the crate, at the same time securely holding it for transporting. With this equipment, one man can readily handle full or empty carboys. Rugged welded steel construction is used throughout with rigidly reinforced tubular steel handles. The unit is light in weight, occupies a minimum of floor space, and maneuvers, it is stated, easily even over rough floors.

Literature is available from the manufacturer and units are available for free trial or test.

Large Output for Hopper Type Barrel Plater

An installation of a new hopper type barrel plating machine made at the Chrysler-Plymouth plant in Detroit, by the Hanson-Van Winkle-Munning Co., Matawan, N. J., has been in operation for a sufficient length of time to yield production figures, which indicate the efficiency of the equipment.

Hopper type barrel plater.

A variety of small parts, which were very difficult to clean by the ordinary dipping basket method, are run through a cleaning cycle, from hopper to hopper, and finally plated in the same series.

Each hopper requires approximately 55 seconds to make a cycle. That is, from the time the button is first pushed, it takes 55 seconds for the hopper to rise and return back to its seating position. From the time the first button is pushed until all the work is transferred to the next hopper, 20 seconds elapse. From the time the button on the first hopper is pushed until the fourth hopper comes back to

seating position, 3-2/3 minutes elapse. Production through these hoppers, providing the hoppers are loaded continuously, is one hopper load into the dryer every 110 seconds. The plating cylinders take from 75 to 200 lbs. at a time, depending upon the size and shape of the parts.

At the present time, seven men are required in this plating line, employed as follows:

1 man shoveling stock into cleaning cylinders.
1 man operating the hoist on the cleaning unit.
1 man taking care of loading the plating cylinders from the skid table.
2 men on the plating unit.
1 man on the hoppers.
1 man on the dryer.

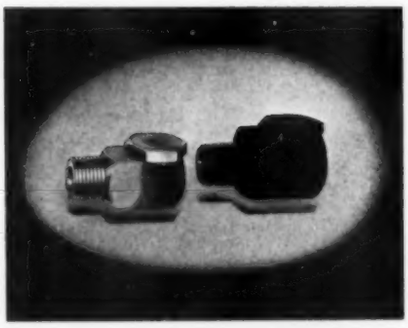
It is estimated that with a slight change, this force can be reduced to five, who will equal the present production of from 3,000 to 4,000 pounds of work per hour.

It is stated by the Chrysler Company that visitors are welcome to see this installation at any time.

Corrosion Resistant Nozzles

The illustration shows a non-clogging spray nozzle just placed on the market by Spraying Systems Co., 4021 W. Lake St., Chicago, Ill.

These nozzles are available in brass, all iron, hardened steel, stainless steel, Monel metal, lead, hard rubber, and other materials as required.



Corrosion resistant nozzles.

Pipe connection is ⅜" male and capacities range from 0.5 to 2.5 G.P.M. at ten pounds' pressure. The nozzles produce a hollow cone spray with uniform distribution. They are of sturdy construction and have large passages making them practically clog proof, it is reported.

The nozzles are to be used for various industrial and chemical processes, as well as air conditioning.

Manufacturers' Literature

Alkaline Cleaning. An illustrated booklet has been issued by the Pennsalt Cleaner Division of the Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa., showing the application of alkaline cleaning to various types of industry. It describes the use of alkaline cleaning previous to plating, enameling, painting, etc., in soak, electrolytic, and power washer cleaning operations.

Chemicals. The latest edition of "Chemicals by Glyco" of the Glyco Products Co., Inc., 148 Lafayette St., New York, is now ready for distribution. This is a 96-page catalog describing glycol and glycol derivatives. Considerable data are also given on other chemicals available, as well as valuable tables and working information.

Cleaners for Plating. Bulletin No. C-104 describes a complete line of cleaners for removing greases, oils, polishing and buffing residues, etc., from metal surfaces of all types, preparatory to plating and finishing. The bulletin covers eight different cleaners and three soaps. Hanson-Van Winkle-Munning Co., Matawan, N. J.

"Designing for Die Casting" is the title of a booklet issued by the New Jersey Zinc Co., 160 Front St., N. Y., giving designing information for die castings. The booklet contains descriptive matter and drawings illustrating the various features, such as studs, ribs, blind holes, undercuts, movable cores, etc., to be considered in designing for die castings.

Grinding. "Grinding and Finishing with Portable Equipment" is the title of a 24-page booklet, well illustrated, published by the Norton Co., Worcester, Mass. The booklet contains recommendations for the portable grinding of various types of castings, for finishing of welds, the use of portable grinders in the railway industry, stone industry and tool room.

Immersion Heaters. Calrod immersion heaters are described in a 4-page folder issued by the General Electric Co., Schenectady, N. Y. The folder contains ratings and prices of immersion heaters for heating water, non-circulating and circulating oils.

Metal Cleaners. "Cowles Metal Cleaners" is the title of a booklet just published by the Cowles Detergent Co., 10525 Carnegie Ave., Cleveland, Ohio, describing the company's various plants and alkaline cleaners available to industry.

Nickel Alloys. A general guide to the uses and properties of nickel and high nickel alloys is incorporated in a new 16-page booklet published by the International Nickel Co., 67 Wall St., N. Y. This publication includes material on nickel, Monel, Inconel and associated alloys.

Nickel Stripping Process. The Chemical Corp., 93 Broad St., Springfield, Mass., have published a folder entitled, "A New Nickel Stripping Process Using Stripode", which describes the company's new addition agent to be added to sulphuric acid strips for stripping plated coatings, which reduces the attack on the base metal, saving acid and subsequent finishing costs.

Polishing Head. Various types of polishing heads for automatics are illustrated in Bulletin No. 45 issued by Hammond Machinery Builders, Inc., Kalamazoo, Mich.

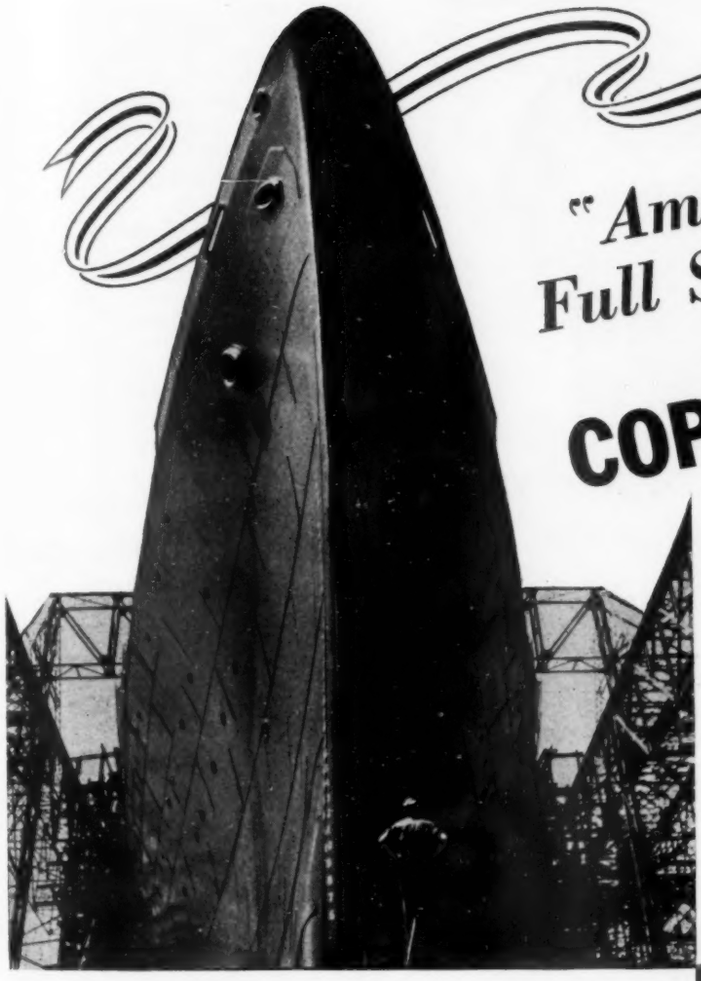
Polishing Machines. Bulletin No. 40 and 41 of the Hammond Machinery Builders, Inc., Kalamazoo, Mich., illustrating and describing rotary and straight line automatic polishing and buffing machines for finishing many types of work.

Porcelain Enamel Color Matching. The Porcelain Enamel and Mfg. Co., Baltimore, Md., describe their book "Porcelain Enamel Colors and Color Matching", in a 4-page, well illustrated folder. The book described enables rapid and accurate matching of colors against standard colors published in the reference book. "Porcelain Enamel Colors and Color Matching" may be obtained from the company for $1.00 per copy.

Portable Tools. Skilsaw, Inc., 5033 Elston Ave., Chicago, Ill., have described their line of portable electric tools in catalog No. 41, just issued. Portable tools, such as, saws, drills, sanders and grinders are described.

Protective Rack Coatings. Michigan Chrome Co., 6340 E. Jefferson Ave., Detroit, Mich., have illustrated and described their protective coatings for plating racks in a recent bulletin. The coat is applied by dipping multiple coats and is said to offer protection against the complete plating cycle.

Safety Equipment. Boyer-Campbell Co., 6540 Antoine St., Detroit, Mich., in their

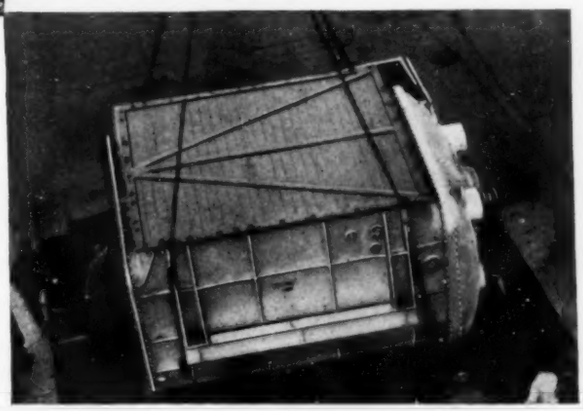


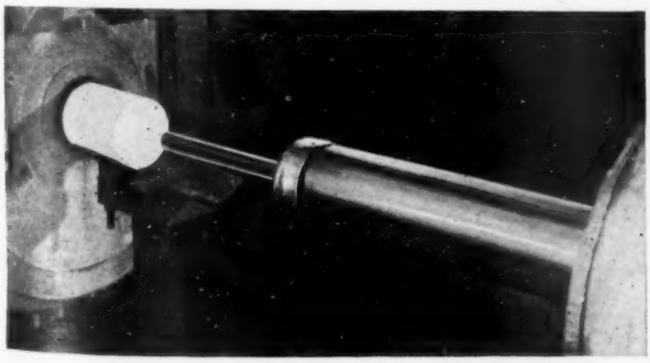
"America" Goes Full Steam Ahead!

with COPPER-NICKEL condenser tubes

The new S.S. "America" symbolizes metallurgical and ship-building advancement. Alloys will increase her efficiency and reduce operating and maintenance costs. Nickel alloyed irons, steels and non-ferrous materials are widely used in numerous applications from pumps to plumbing fixtures, windlass shafts to steering rams, from bulkhead fittings to compass rigs . . . each Nickel alloy chosen for the job it does best.

Two main and two auxiliary condensers in the "America" employ 130,000 lbs. of 70/30 Copper-Nickel tubes. These corrosion-resistant Copper-Nickel tubes are not subject to the type of corrosion known as dezincification. This Copper-Nickel alloy forms a light protective film which assures high resistance to corrosion, erosion and impingement attack. Main condenser tubes, all produced by Revere Copper and Brass, Inc. are 14′3″ long, ¾″ in diameter and 1/16″ thick. Nickel alloyed materials provide uniformly high physical properties at low cost per year.





Copper-Nickel of 70/30 composition fabricates readily, an advantage which is reflected in its moderate price. The Copper-Nickel alloys are highly ductile yet retain full strength and toughness when pierced, drawn or extruded. Here a hot Copper-Nickel billet is being pierced in the Revere plant, first step in forming improved condenser tubes. Your consultation is invited regarding marine applications of materials strengthened and toughened with Nickel.

(Photos courtesy Revere Copper & Brass Inc.)

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

catalog No. 40, entitled, "Everything for Safety", describes and illustrates all types of safety equipment for workers in industry. Face shields, respirators, goggles, clothing and safety appliances, are illustrated.

Soldering Fluxes. Various soldering fluxes developed by the American Chemical Paint Co., Ambler, Pa., are described in Bulletin No. 5. Fluxes described are: a liquid flux, which is a self-cleaning soldering acid for sheet metal work; a liquid for soldering ferrous and non-ferrous alloys, which is not self-cleaning, and paste and cream soldering fluxes.

Stereoscopic Microscopes. The line of stereoscopic microscopes of Spencer Lens Co., Buffalo, N. Y., is illustrated in a recent catalog. These microscopes are for stereoscopic vision under relatively low magnification with a large working space between objective and work.

Test Sets. Hull and Strausser tests for zinc, cadmium, tin and copper for rapidly determining the thickness of these coatings, have been described in a bulletin recently issued by E. I. duPont de Nemours & Co., Inc., Wilmington, Dela. The apparatus, solutions used, directions for operation and pertinent details regarding the tests, are given

Test Sets. Kocour Co., 4724 S. Christiana Ave., Chicago, Ill., have published a recent bulletin describing and giving prices for analytical sets for determining the thickness of cadmium, zinc, copper and tin deposits, as described in the previously mentioned DuPont book.

Tube Benders. "Parker Benders" is the title of bulletin No. 40E of the Parker Appliance Co., 17325 Euclid Ave., Cleveland, Ohio, giving prices, illustrating and describing various types of equipment for bending tubes.

Weld Spatter Compound. The General Electric Co., Schenectady, N. Y., describes their G-E Glyptal No. 1294 compounds for preventing adhesion of welding spatter in a recent bulletin. The bulletin discusses clear, red and gray compounds which possess various unique features in preventing adhesion of welding spatter.

Wire Drawing Compounds. Magnus Chemical Company, Garwood, N. J., have issued a booklet entitled "Wire Mill Performance Reports"—which embodies a series of detailed performance reports from ferrous and non-ferrous wire mills outlining improvements and economies effected by the use of properly selected wire drawing compounds, contrasted with previously used methods.

Associations and Societies

Electrochemical Society

A full report of the 77th semi-annual meeting of this Society, held April 24-27 at Wernersville, Pa., together with abstracts of the papers presented, will be published in the June issue of METAL INDUSTRY.

American Electroplaters' Society Annual Convention at Dayton

A full report on speakers on the program will appear in the June issue. Twenty-five technical papers will be presented at six educational sessions. The International Fellowship Club will entertain on Monday evening as usual, and the ladies are well taken care of throughout the four days of the convention. In addition to the educational session, the men will have a factory trip through the National Cash Register Co., and the Frigidaire Corp. On Wednesday afternoon, an outing will be held at the Springfield Country Club—where members can swim, dance, play baseball or golf. The ladies' program includes a bridge-luncheon with fashion show, the International Fellowship Club party, group breakfasts, a tour through the National Cash Register Company with an organ recital, theatre parties, tours through stores and an art institute, —and last but not least, the second annual meeting of Oakite's Dave X. Clarin's Aunt Ella's party.

Wing Your Way to Dayton

Boston Branch

A very successful educational session and banquet was held on April 13th, with a large attendance at the educational session and over 300 at the banquet and dance. The affair was run off with the usual smoothness that is characteristic of the Boston meetings. At the educational session, presided over by *Arthur Mintie*, talks

were presented by *Robert Sizelove* of Frederick Gumm Chemical Co., Kearney, N. J., *Edwin C. Rinker*, Oakite Products, Inc., New York City, *Myron Diggin* of the Hanson-Van Winkle-Munning Co., and *Nathan Promisel* of the International Silver Co.

Detroit Branch

On June 7th, the speaker will be *Walter L. Pinner*, General Spring Bumper Division, Houdaille-Hershey Corp., Detroit, Michigan.

Newark Branch

Dr. Karl Schumpelt of Baker & Co., Newark, N. J., will be the speaker at the May 17th meeting.

New York Branch

On Friday, April 12th, *H. Leroy Beaver* addressed the Branch on "Barrel Finishing of Metal Products." The meeting was well attended and a lively discussion followed the talk.

Los Angeles Branch

Don M. Bedwell of Hallenscheid and McDonald, Los Angeles, was elected president of Los Angeles Branch, A.E.S., at the monthly meeting held April 10 at Hotel Rosslyn.

Frank Rushton was elected vice-president and *Ervin Frauenhof*, secretary-treasurer. *E. R. Holman* was returned to office as librarian for another year and *Carl C. McLaren* was re-elected sergeant-at-arms.

The existing Board of Managers was retained—*Ernest Lamoureux*, chairman; *C. E. Thornton* and *Earl Coffin*.

Chosen as delegates to the convention were retiring president *Ray Bray*, *Don Bedwell* and *Ernest Lamoureux*.

Chicago Branch was appointed to act as proxy for Los Angeles Branch at the Dayton, Ohio, national convention in June.

The application for associate membership in Los Angeles Branch of *W. A. Anderson*, Sidney, Australia, was acted upon favorably. Mr. Anderson is technical adviser of the New South Wales Government Railroad.

A play-back of the address delivered by *Dr. William Blum*, National Bureau of Standards, at the morning meeting of the March 30 Annual Educational Session, featured the program on the night of April 10.

C. M. Knights Appointed Manager of H-VW-M Detroit Office

Cecil M. Knights has been appointed manager of the Detroit office of the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating equipment and supplies.

Mr. Knights is truly a specialist in the electroplating industry. A graduate of the Public High School of Chicago, he spent four years as an apprentice at the National Plating Company in Chicago, working in every department, gaining a thorough grounding in polishing and plating, after which he became the owner of the Central Plating Company of Chicago, a job and contract shop and continued in that capacity for ten years. He then accepted an offer to take charge of the Polishing and Plating Department of the Chicago Flexible Shaft Company, one of the large shops in that district, where he remained for three years. In 1929, he joined the Hanson-Van Winkle-Munning Company as a salesman, with headquarters in their Chicago office.

Mr. Knights remained at this post for eleven years. He was transferred to the Detroit office on October 1st, 1939, and on January 1st became Manager of that office.

Mr. Knights, having spent practically all of his working life in the electroplating field, is known throughout the industry, especially in the West. He is popular not only in his own company, where his associates know him as "Chick", but everywhere in the trade whom he has impressed with his pleasant personality and his keen desire to serve his customers to their best advantage. He takes his new post with the good wishes of all of his associates and many friends throughout the industry.

Cecil M. Knights

New Books

A.S.T.M. Standards 1939. *Part I. Metals.* Including Tentative Standards. Published by the American Society for Testing Materials, Philadelphia, Pa. Size 6" x 9"; 1308 pages. Price, $8.00 to non-members; $5.50 for members of the A.S.T.M.

This book has been extensively revised and amplified which covers ferrous and non-ferrous metals except methods of chemical analysis (a separate volume on Chemical Analysis of Metals is available). General testing methods are given, 300 specifications, tests, definitions—180 on ferrous metals; 105, non-ferrous metals and alloys —15 applying to both.

Index to A.S.T.M. Standards Including Tentative Standards. Published by American Society for Testing Materials, Philadelphia, Pa. Size 6" x 9"; 141 pages. Copies are furnished without charge on written request to A.S.T.M., 260 S. Broad St., Philadelphia, Pa.

This publication gives information on all of the 885 standards as of January 1, 1940. The Index is of service to anyone wishing to ascertain whether the Society has issued standard specifications, test methods or definitions covering a particular engineering material or subject and it is of help in locating the standards in the volumes where they appear.

All items are listed in the Index under appropriate keywords according to the particular subjects they cover. As a convenience, a list is given of the specifications and tests in numerical sequence of their serial designations.

Impact Cleaning, by William A. Rosenberger. First Edition. Published by The Penton Publishing Co., Cleveland, Ohio. Size 6" x 9"; 457 pages. Price $7.00.

This book covers all the complex factors pertaining to impact cleaning, written by an eminent impact cleaning engineer.

Each step in the many processes, with the equipment involved, is clearly explained through the medium of line drawings and text. Various types of impact cleaning equipment, such as direct-pressure equipment, gravity-feed waterblast equipment, and abrasives calculations, power requirement, ventilation and many other factors are considered.

The book is very comprehensive and thoroughly done and should be of value to those who design, manufacture, sell or use impact cleaning equipment.

Refining Precious Metal Wastes, by C. M. Hoke. Published by Metallurgical Publishing Co., 123 William St., New York. Size 6" x 9"; 354 pages. Price $5.00.

This new volume tells how to recover and purify the precious metals—gold, silver, platinum, palladium and the other platinum group metals from such materials as jewelers' wastes, dental wastes, photographers' wastes and other wastes.

The book is written in a simple manner so that it will be understandable even to

the layman. Technique, equipment and other pertinent information for practical use, is clearly given.

This book is based on Miss Hoke's 24 years of experience in teaching jewelers and others how to refine their precious metals.

The book also contains a discussion of hazards attendant with the analysis of precious metal wastes and regulations pertaining to this field, a list of dealers in precious metal scrap and a complete bibliography of both books and articles on this subject.

Colloidal Phenomena, by Dr. Ernst A. Hauser. First Edition. Published by McGraw-Hill Book Co., New York. Size 6" x 9"; 272 pages. Price $3.00.

This book contains more than the prosaic discussion of colloidal chemistry. It is written by Ernst A. Hauser, renowned colloidal chemist, formerly of Germany and now associate professor of engineering at M.I.T.

The book provides a full, logically-developed introduction to the various phenomena of colloidal chemistry and physics, and the basic reasons causing them. Emphasis is laid on the importance of the form and shape of matter in the field of colloids and the peculiarities of the colloidal state which will clearly distinguish them from systems in other degrees of dispersion.

The book starts with the historical development of the science of colloids and then considers the dispersed state of matter. Production of colloids, kinetics, electrical properties, protection, and sensitization of colloidal system are discussed.

The book is well illustrated with drawings to better understand the physical concepts of the colloidal state. Appended are discussions of various special aspects of colloidal chemistry, especially calculations and equipment.

The Physical Examination of Metals, by Bruce Chalmers. Volume I. Published by Longmans, Green & Co., New York. Size 5¾" x 8¾"; 176 pages. Price $4.00.

This is the first volume of two volumes to be published on physical examination of metals, this volume dealing with optical methods.

The object of the book is to explain, in simple language, the physical theory underlying these methods, to describe the more important applications that have been made, and where possible, to describe the technique so that the reader can apply it himself.

Chapters are: Geometrical Optics; Wave Optics of Interference Phenomena; Wave Optics of Diffraction Phenomena; Polarized Light; Sources of Light.

The book occupies a distinct place in the literature pertaining to the examination of metals and is vastly different and more valuable than the usual books on metallography. The book is clearly written and, although not profusely illustrated, the illustrations are good.

This book is recommended to all those interested in physical metallurgy and metallography, as well as to students of the physics of metals.

Testing of Porcelain Enameling Furnaces, by M. J. Bozsin. A report of an investigation conducted by The Research and Analytical Laboratories of the Ferro Enamel Corp., Cleveland, Ohio. Published by the Technical Staff of mentioned company. Size 6" x 9"; 51 pages.

This booklet describes technique used in testing porcelain enamel furnaces, equipment used and data on various types of atmospheres of commercial enameling furnaces. Charts pertaining to this subject are appended.

Standard Metal Directory. Eighth Edition. 1940. Published by the Atlas Publishing Co., New York. Size 6" x 9"; 605 pages. Price $10.00.

This is the 8th edition of this book, the previous one having been published in 1936. The older edition has been completely revised and all information brought up to date.

The directory is divided into four special sections embracing iron and steel plants; ferrous and non-ferrous metal foundries; metal rolling mills; smelters and refiners of non-ferrous metals.

In these lists will be found more than 11,000 detailed reports on steel mills, ferrous and non-ferrous metal foundries, metal smelters, metal rolling mills and non-ferrous metal plants in the United States and Canada; arranged geographically and alphabetically. These reports give the name of the company, capitalization, location,

officers, etc. Other available commercial information is included, such as distributors of metals and ores, smelters, importers and exporters, railroad purchasing agents, trade associations, etc.

The directory is an excellent and valuable reference for the steel and metal industries and is of special value to purchasing agents and sales managers.

Metal Statistics 1940. Published by American Metal Market, 111 John St., N. Y. Size 4" x 6"; 692 pages. Price $2.00.

This is the 33rd annual edition of a statistical record on metals. The book has been enlarged to cover consumption of steel scrap, data pertaining to copper alloys, zinc and other metals.

The book should be of interest to all those interested in metal statistics. Only a limited number of copies are available for distribution.

Cast Metals Handbook. 1940 Edition. Published by American Foundrymen's Association, 222 W. Adams St., Chicago, Ill. Size 6" x 9"; 504 pages.

This is the 1940 revised edition of the book appearing in 1935.

The volume represents the efforts of various divisions, both ferrous and nonferrous, of the American Foundrymen's Association, Inc. Various technical metallurgists throughout the country were drawn on for information or other contributions.

The book considers recommendations to designers of castings, selection of alloys, recommendations to buyers of castings, physical properties of metals and specification data in considerable detail on cast steel, malleable iron, cast iron and nonferrous alloys.

The book should be an indispensable guide to foundrymen, engineers and purchasing agents.

Personals

Dr. C. L. Mantell, Consulting Chemical Engineer, spoke before the Wilmington-Philadelphia Chapter of the American Institute of Chemical Engineers on April 9th on "The Chemical Engineer in the Electrochemical Industries," at the du Pont Country Club, Wilmington, Del.

DuPont Promotes C. M. Hoff and F. F. Oplinger

Clayton M. Hoff, formerly assistant manager of the Electroplating Division of the du Pont Company, has been appointed manager of this Division to succeed *J. C. Pickard,* who has been transferred to the R. & H. Chemicals Department of the company.

Floyd F. Oplinger of the Niagara Falls Division has become assistant manager of the Electroplating Division, succeeding Mr. Hoff.

Clayton M. Hoff

Floyd F. Oplinger

Business Items

Frederick Gumm Chemical Company Celebrates Tenth Anniversary

The Frederick Gumm Chemical Co., is now celebrating its tenth anniversary, having started business in 1930. The company moved to their own plant in Kearney, N. J., in 1936. An addition to the plant was made in 1940. The company possesses a well equipped laboratory to investigate cleaning and plating problems with two research chemists employed to investigate

Plant of Frederick Gumm Chemical Company.

Laboratory of Frederick Gumm Chemical Company.

problems in cleaning. The company employs fourteen salesmen. *Frederick Gumm* is president; *Charles R. Percival,* vice-president and treasurer; and *Robert R. Sizelove,* secretary.

Goodrich Electric Co., 2901 N. Oakley Ave., Chicago, Ill., manufacturers of porcelain enameled lighting fixtures for industrial use, reports the near completion of their new plant, located on the northwest side of Chicago. The plant, which will have 146,000 sq. ft. of floor space, will be ready for occupancy in July or August. Departments operated are: stamping, spinning, welding, plating, vitreous enameling, sand blasting, grinding, buffing, tumbling, descaling, pickling, alkaline cleaning, solvent degreasing, rust proofing and enameling. Principal base metals used are steel and aluminum.

Century Electric Co., (District Office), is now located at 600 W. Van Buren St., Room 412, Chicago, Ill. *H. A. Porter* is regional sales manager and *H. L. Madsen,* district sales manager.

The Lea Manufacturing Co., Waterbury, Conn., has been appointed New England distributor for the Aminco-Brenner Magne-Gage, manufactured by the *American Instrument Co.,* Silver Spring, Maryland. The Magne-Gage is an instrument for accurately and rapidly measuring thickness.

Hisey-Wolf Machine Co., 2745 Colerain Ave., Cincinnati, Ohio, was sold to *Louis Goldsmith*. Mr. Goldsmith will continue to operate the firm under its present name and at the said location.

Zierold Metals Corp., recently incorporated in Los Angeles, Calif., have occupied a larger plant in nearby Burbank, to which a new unit will soon be added. The following departments are operated: stamping, soft soldering, hard soldering, brazing, welding, grinding, polishing and buffing. Principal base metals used are: steel, bronze, and aluminum.

Sunbeam Electric Mfg. Co., Read St. and Morgan Ave., Evansville, Ind., Coldspot electric refrigerators and locomotive lighting equipment, recently purchased power house equipment, including two 400-hp. watertube boilers, two forced-draft traveling grate stokers, soot blowers, etc. The following departments are operated: drawing, stamping, soft soldering, hard soldering, brazing, welding, plating, hot tinning, vitreous enameling, sand blasting, grinding, polishing, buffing, barrel burnishing, tumbling, pickling, cleaning, degreasing, rust proofing, lacquering, enameling, japanning and painting. Principal base metals used are: steel, copper, brass, aluminum.

Metal Stamping & Mfg. Co., 16816 Waterloo Rd., Cleveland, Ohio, has changed its name to *Morrison Products, Inc.*, effective May 1st. There has been no change in stockholders, directors or personnel.

The Lea Mfg. Company of Waterbury, Conn. has been appointed distributor in New England for the line of soft rubber polishing wheels manufactured by *The West Co., Inc.*, Philadelphia, Pa.

Colonel A. L. Mercer, president and *H. L. Trembicki*, manager of the Metal Cleaner Department of the *Cowles Detergent Co.*, 10525 Carnegie Ave., Cleveland, Ohio, announce the appointment of *Clyde E. Lowe* as representative in the Pittsburgh area. Mr. Lowe has been serving this district in a sales capacity for the past several years for the Swan-Finch Oil Co. Mr. Lowe will work out of Pittsburgh in collaboration with Apex Soap & Sanitary Co., McKees Rocks, Pa., who have recently been appointed Cowles distributors.

Sulphur Products Co., Inc., Greensburg, Pa., announces the appointment of *J. E. Ledger* of Dayton, Ohio, as their special representative in the State of Ohio. Mr. Ledger will solicit orders and service accounts on McKeon's "Liquid Sulphur" and Natrolin B-4 chrome cleaner.

Metal Finishing Firm Expands

Henry Nelkin, Inc., electroplaters and polishers, 128 Mott Street, New York City, have once again expanded their business. They have added another floor to their plant and installed two new departments: baking and enameling, and tumbling.

The baking and enameling department includes two 10'x10'x8' baking ovens and three smaller ovens. The increased floor space has permitted the installation of the most modern methods of production for all types of sprayed, baked and synthetic finishes on their customers' products.

The tumbling department includes six new cadmium plating barrels, six modern nickel tumbling barrels and four of the latest model burnishing barrels.

Henry Nelkin, Inc. started as a small business twenty-six years ago. Within the last six years they have enlarged their plant to meet the changing trends of industry. The business is still actively managed by *Henry Nelkin* and *Louis Schoenwetter*. Their sons, *Julian Nelkin* and *Herbert Schoenwetter* have been brought up in the business and occupy key positions. Their specialties are lamps and lighting fixtures, photographic parts, as well as all types of beauty parlor equipment.

New Cleaning Developments Discussed At Oakite Conference

Held last month in New York City, the annual Spring Technical Sales Conference of the Northeastern and Philadelphia Divisions of Oakite Products, Inc., reviewed several recently developed and improved cleaning materials designed for effectively handling an extensive range of production and maintenance cleaning operations. Attending the two-day session were over forty Oakite field service representatives, together with members of the Company's technical and service staffs.

Two recent developments of particular interest to the metal-working industry commanded major attention. The first was Oakite Composition No. 54-B, an improved material which has made possible the electrocleaning of polished steel and buffed copper in a single tank, before plating, without the need of pre-soaking or subsequent wiping or brushing.

The second new development discussed was Oakite Pickle Control, a soluble, non-foaming type of inhibitor that is reported to reduce hydrogen embrittlement, improve washing conditions and provide several other notable advantages in production pickling operations.

Among other subjects discussed were safely cleaning brass, aluminum and aluminum alloys and die castings; and preventing water stains on finished metal products.

Letters From Our Readers

(*Continued from page* 271)

much experimenting done with both. I have found that both direct and reverse current give best results, or as it is now known, anodic and cathodic cleaning.

Then there was also developed what is known as a double throw switch for use on the installation so that one can use either anodic or cathodic cleaning.

The development of the proper tanks and the placing of the steam coil on the front side of the tank instead of the bottom of the tank was first used. The idea is that with a boiling solution, the coils being on the front side of the tank would cause the solution to boil away from the front toward the back of the tank, causing the substance that would be floating

on top of the solution to go toward the rear, leaving a clean boiling solution in front through which the work would pass when removing it from the solution.

Between 1908 and 1940, there have been many developments in cleaning metals, among them, in the late years, is the degreasing process. But the electrocleaner is still being used in connection with the degreasing process, and then too there is the hot spray which is quite a development and is very efficient as well as the cold spraying for rinsing before and after plating.

About 1910 or 1911, Chas. H. Proctor developed a combination copper plating electric cleaning solution which is still being used and is quite efficient. The development of this solution was an accident. I mean its discovery was made by accident. It was common practice in those days that whenever a cleaning tank was to be cleaned, and I still believe it good practice, that a bucket of the old solution was set aside or saved and after the tank was cleaned and refilled with water that this bucket of old solution would be put into the clean solution. The claim is that it takes too long for a new solution to become conditioned by electrolysis but with this bucket of old solution, it does not take any time to be conditioned. Be this as it may, it is not a bad idea.

Well, to get back to this accidental discovery of the copper plating and electrocleaning solution, the assistant helping to clean the old solution out and putting the new one in, did something wrong because when they started to clean the work in it with direct current, the work was copper coated and Charlie Proctor could not understand the reason until he questioned the assistant and it was discovered that he, instead of using the bucket of old solution, had taken a bucket of copper plating solution and put it in the cleaning tank. Therefore, Mr. Proctor reasoned that if he were to use copper anodes and a little cyanide in the cleaning solution, he could make a combination copper plating electrocleaning solution and save the copper striking solution and operation. It worked all right.

Then there is the question of anodes for the electrocleaner. Should one use anodes or just have the tank hooked up instead. I will state that I've found it more efficient to use the tank instead of anodes. I know there has been much controversy on this question but believe it is still up to the individual installation as to which is the better.

Some time later I will try to write something on pickling and acid dips and their development; also of some of the so-called experts who made a fortune out of peddling the secrets of certain pickles.

I trust that this story will be interesting to some of the old-timers who can remember that far back and to some of the young men of the industry, who have practically every convenience at hand and ready made for use by just using a 'phone, and service can now be obtained pronto.

T. C. Eichstaedt.

April 1, 1940.

Supply Prices, April 29, 1940

Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER: Cast ..... 21⅝c. per lb.
Electrolytic, full size, 16⅝c.; cut to size 16⅝c. per lb.
Rolled oval, straight, 17⅛c.; curved .. 18⅛c. per lb.
BRASS: Cast ..... 18½c. per lb.
ZINC: Cast ..... 11 c. per lb.

NICKEL: 90-92%, 16" and over ..... .45 per lb.
95-97%, 16" " " ..... .46 per lb.
99%+cast, 16" and over, 47c.; rolled, depolarized, 16" and over, 48c.
SILVER: Rolled silver anodes .999 fine were quoted from 38c. per Troy ounce upward, depending on quantity.

Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

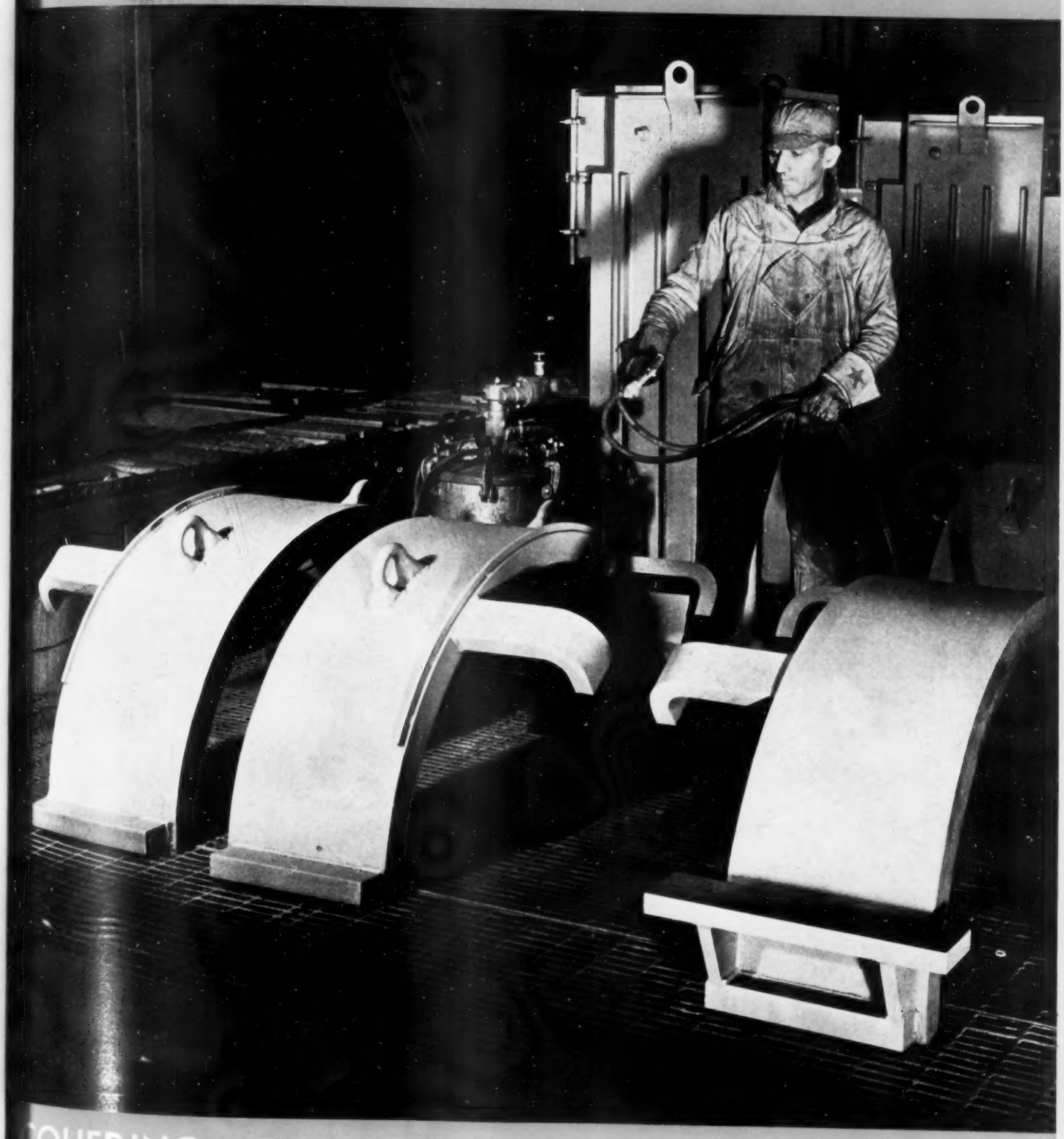
Acetone, Pure, l.c.l., drums	lb.	.08
Acid, Boric (boracic) granular, 99.5%, bbls.	lb.	.053-.059
Chromic, 99%, 100 lb. and 400 lb. drums	lb.	.16¾-.17¼
Hydrochloric (muriatic) Tech., 20°, carboys	lb.	.027
Hydrochloric, C.P., 20°, carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36°, carboys	lb.	.06
Nitric, 42°, carboys	lb.	.075
Oleic (Red Oil), distilled, drums	lb.	.085-.10
Oxalic, bbls. l.c.l.	lb.	.12-.14
Stearic, double pressed, distilled, bags	lb.	.10½-.11½
single pressed, distilled, bags	lb.	.10-.11
triple pressed, distilled, bags	lb.	.13¼-.14¼
Sulphuric, 66°, carboys	lb.	.025
Alcohol, Amyl, (Fusel oil, ref'd), l.c.l., drums	lb.	.175
Butyl-normal, l.c.l., drums	lb.	.095-.105
Denat., S.D. #1, 190 pf., 1-18 drms, wks.	gal.	.335
Diacetone, pure, drums, l.c.l.	lb.	.10
Methyl, (Methanol), 95%, drums, l.c.l.	gal.	.36
Propyl-Iso, 99%, l.c.l., drums	gal.	.41
Propyl-Normal, drums	gal.	.70
Alum, ammonia, granular, bbls., works	lb.	.035
Potash, granular, bbls., works	lb.	.0375
Ammonia, aqua, 26°, drums, carboys	lb.	.02½-.05¼
Ammonium, chloride (sal-ammoniac), white, granular, bbls.	lb.	.0521-.075
Sulphate, tech., bbls.	lb.	.035-.05
Sulphocyanide (thiocyanate), pure, crystal, kegs	lb.	scarce
Sulphocyanide (thiocyanate), com'l, drums	lb.	"
Antimony Chloride (butter of antimony), sol., carboys	lb.	.13
Barium Carbonate, ppted., l.c.l., bags, works	lb.	.03
Benzene (Benzol), pure, drums, works	gal.	.21
Butyl Lactate, drums	lb.	.235
Cadmium Oxide, l.c.l., bbls	lb.	.85
Calcium Carbonate (Ppted. chalk), U.S.P.	lb.	.05¾-.075
Carbon Bisulfide, l.c.l., 55 gal. drums	lb.	.05¾-.06
Carbon Tetrachloride, l.c.l., drums	gal.	.73
Chrome, green, commercial, bbls.	lb.	.21
Chromic Sulphate, drums	lb.	.26¼
Cobalt Sulphate, drums	lb.	.65
*Copper, Acetate (verdigris), bbls.	lb.	.25
Carbonate, 53/55%, bbls.	lb.	.16-.17¼
Cyanide, Tech., 100 lb. bbls.	lb.	.34
Sulphate, Tech., crystals, bbls.	lb.	.051
Cream of Tartar (potassium bitartrate), gran., bbls.	lb.	.31¼
Crocus Martis (iron oxide) red, tech., kegs	lb.	.07
Dibutyl Phthalate, l.c.l., drums	lb.	.195
Diethylene Glycol, l.c.l., drums, works	lb.	.155
Dextrine, yellow, kegs	lb.	.05-.08
Emery Flour (Turkish)	lb.	.07
Ethyl Acetate, 85%, l.c.l., drums	lb.	.075-.085
Ethylene Glycol, l.c.l., drums, works	lb.	.17-.20
Flint, powdered	ton	30.00
Fluorspar No. 1 ground, 97-98%.	ton	$60.00
Fusel Oil, refined, drums	lb.	.125-.14
*Gold, Chloride	oz.	$18¼-23
Cyanide, potassium 41%	oz.	$15.45
Cyanide, sodium 46%	oz.	$17.10
Gum, Arabic, white, powder, bbls.	lb.	.125-.14
Sandarac, prime, bags	lb.	.50
Hydrogen Peroxide, 100 volume, carboys	lb.	.20
Iron Sulphate (Copperas), bbls.	lb.	.017
Lead, Acetate (Sugar of Lead), bbls.	lb.	.11-.13¾
Oxide (Litharge), bbls.	lb.	.125
Magnesium Sulphate (Epsom Salts), tech., bag	lb.	.018
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Mercuric Oxide, red, powder, drums	lb.	$3.06
Nickel, Carbonate, dry, bbls.	lb.	.36-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.135-.145
Salts, double, 425 lb. bbls.	lb.	.135-.145
Paraffin	lb.	.05-.06
Perchlorethylene, drums	lb.	.08½
Phosphorus, red, cases	lb.	.42
yellow, cases	lb.	.40
Potash, Caustic, 88-92%, flake, drums, works	lb.	.07¼-.075
Potassium, Bichromate, crystals, casks	lb.	.09¼
Carbonate (potash) 98-100%, drums	lb.	.06¾
Cyanide, 94-96%, cases	lb.	scarce
Pumice, ground, bbls.	lb.	.03
Quartz, powdered	ton	$30.00
Quicksilver (Mercury) 76 lb. flasks	flask	$90.00
Rochelle Salts, crystals, bbls.	lb.	.24¼
Rosin, gum, bbls.	lb.	5.25-7.75
*Silver, Chloride, dry, 100 oz. lots	oz.	.32
Cyanide, 100 oz. lots	oz.	.33½
Nitrate, 100 oz. lots	oz.	.27
Sodium, Carbonate (soda ash), 58%, bbls.	lb.	.0235
Cyanide 96%, 100 lb. drums	lb.	.15
Hydroxide (caustic soda) 76%, flake	lb.	.0355
Hyposulphite, crystals, bbls.	lb.	.035-.065
Metasilicate, granular, bbls.	lb.	.0335
Nitrate, tech., bbls.	lb.	.029
Phosphate, tribasic, tech., bbls.	lb.	.0295
Pyrophosphate, anhydrous, bbls., l.c.l.	lb.	.0580
Sesquisilicate, drums	lb.	.0425
*Stannate, drums	lb.	.32-.34
Sulphate (Glauber's Salts), crystals, bbls., works	lb.	.0135
Sulphocyanide, drums	lb.	.30-.35
Sulphur, Flowers, bbls., works	lb.	.037-.0410
*Tin Chloride, 100 lb. kegs	lb.	.37
Toluene (Toluol), pure, drums, works	gal.	.30
Trichlorethylene, drums	lb.	.08½
Tripoli, powdered	lb.	.03
Wax, Bees, white, bleached, slabs 500 lbs.	lb.	.38-.40
Bees, yellow, crude	lb.	.28-.29
Carnauba, refined, bags	lb.	.59-.70
Montan, bags	lb.	.26-.30
Spermaceti, blocks	lb.	.26-.27
Whiting, Bolted	lb.	.025-.06
Xylene (Xylol), drums, works	gal.	.32
Zinc, carbonate, bbls.	lb.	.14-.17
Cyanide, 100 lb. kegs	lb.	.33
Chloride, granular, drums	lb.	.06
Sulphate, crystals, bbls.	lb.	.04

*Subject to fluctuations in metal prices.

MAY, 1940

ORGANIC FINISHING

SECTION OF METAL INDUSTRY



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ORGANIC FINISHING

SECTION OF METAL INDUSTRY
MAY, 1940

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ARTICLES

DEPARTMENTS

Organic Finishing Goes To School

Indicative of the growing realization on the part of industry that the manufacture and application of organic finishing materials require something more than just rule of thumb is the increasing number of colleges and technical schools which are offering courses in this very important field. Many of these institutions of higher learning are not only including such courses in their regular curricula and encouraging students to accept research problems on the subject, but they are offering extension courses to those who are employed in the finishing field and wish further knowledge. For example, the Massachusetts Department of Education recently conducted a series of evening lectures by well known authorities on the various phases of finishes and finishing at the Massachusetts Institute of Technology. This course covered the use, application, composition, purchase and sale of paints and varnishes and, judged by the large and regular attendance, was a tremendous success.

All of this serves to strengthen our contention that organic finishing can be an exact and reasonable business, with none of the inaccuracies, misinformation and downright hocus pocus which retarded its progress for so long. It is gratifying to see organic finishing take its place in the scientific sun.

L. J. LANGDON, *Publisher* • THOMAS A. TRUMBOUR, *Business Manager* • DR. WALTER R. MEYER, *Editor*

Radiant Energy Drying and Baking For Organic Finishing

By D. J. Stedtefeld
Chief Chemist,
The Clinton Co., Chicago, Illinois

The specific properties of radiant drying of organic finishes are considered. Unique features of drying and installation have enabled more advantageous drying to be obtained for rapid baking of multiple coats. This type of baking is still more or less in the experimental stage and it should be regarded as a complement to oven baking.—Ed.

Industry, ever alert to keep abreast with the newer methods and processes for the improvement of products, has had its attention directed to infra-red rays as a safe and efficient means of performing many of the baking, drying, and heating operations. What has captivated the interest of industrial executives is that the new process of drying is exactly opposite to that of former methods. Under the older systems, the heat applied performed its work first on the outside and penetrated as the heat continued. With the infra-red rays, the action is the reverse,—the rays penetrate and are absorbed, doing their work from the inside out.

The heat is applied by means of carbon filament lamps, resembling in appearance the ordinary incandescent lamps. Specially designed reflectors are attached to these lamps and help to properly distribute the rays. At the present time, incandescent filament sources which are used for industrial drying consume 240 or 260 watts when operating at 115 volts. Advantages claimed for drying or baking by means of infra-red beams are: Low operating cost, less space required, no warm up period necessary, require less time, flexibility of application as the set-up can easily be changed to suit different types of work.

When the electric current is passed through a carbon filament lamp, about 97 per cent of the energy produced is turned into heat waves and 3 per cent into light waves. The heat waves are commonly known as infra-red rays. In the clear glass which is usually used, only 2 per cent is absorbed by the glass, which means that practically all of the energy produced by the carbon filament is available. These rays penetrate beneath the surface. In the case of an enameled surface, it is possible to dry the enamel in a comparatively short time, using the proper lamps and reflectors. Drying conditions vary widely in the different industrial plants, so that most infra-red equipment must be custom-built if it is to result in complete satisfaction. Some points common to all installations are that the reflecting surfaces of the reflectors should be kept clean at all times; whenever possible, the objects to be dried should move through the heat zone, as this will provide more uniform distribution of the energy. The work may be placed, however, under a stationary drying unit, provided the rays from the reflectors overlap each other to eliminate any cold or dead spots. This result is obtained by placing the reflectors close together, also by placing them about 18" to 24" away from the work to get a wide spread. Care must be taken not to use the infra-red lamps on an overloaded line, as this would result in the loss of heating efficiency.

The time required is variable, depending on a number of factors, such as area of surface to be treated, size of lamp bank, atmospheric conditions, etc. Usually it takes from between five to thirty minutes, according to the conditions enumerated above. In an item appearing in Electrified Industry, December, 1938, By T. P. Brown and L. S. Ickis, Jr., both of General Electric Company, it is stated that "Re-

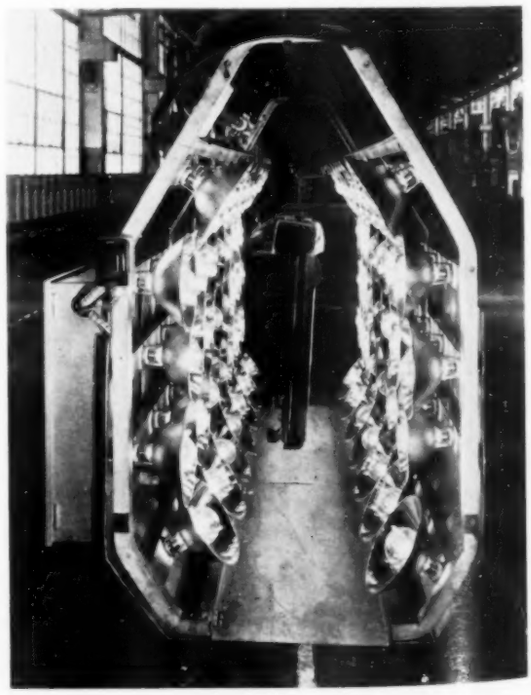

Fig. 1. A small type infra-red unit used for finishing automobile radiators.

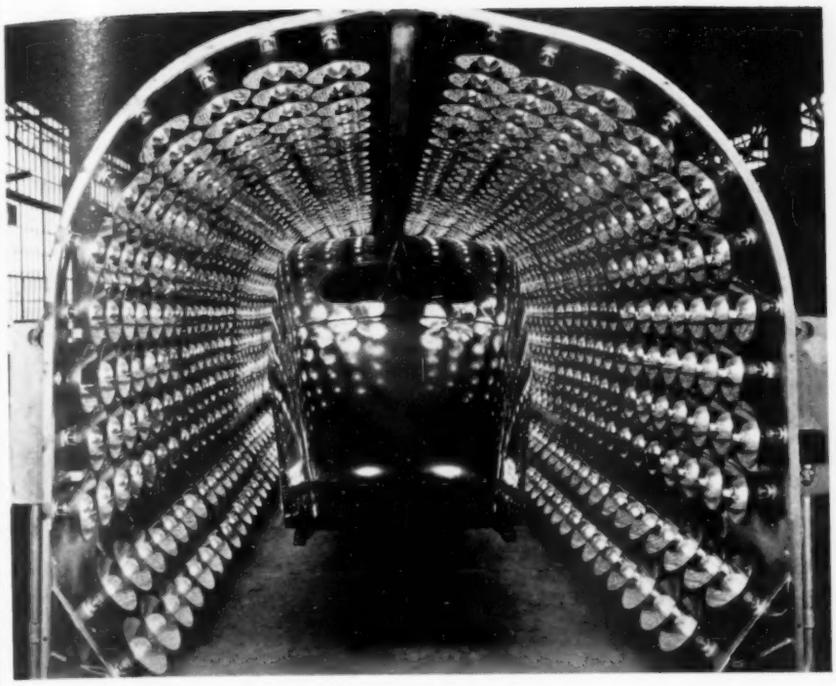

Fig. 2. A lamp tunnel showing arrangement of reflectors so that direct rays reach all parts of the automobile body.

ports from industries which have pioneered the use of this new drying process indicate that synthetic enamels can be dried in about 10% of the time required by the usual methods and that quick-drying lacquers can be dried in from 5% to 15% of the usual time required."

Much depends on how the rays strike the object to be treated. In an article appearing in the February, 1940, issue of Chemical & Metallurgical Engineering, by H. J. Bennett, of Glidden Company, and Howard Haynes, of General Electric Company, it is pointed out that "Since only that part of the energy which is intercepted and absorbed can be useful in raising the temperature of the work, it follows that those objects which present a relatively large area to the lamp in proportion to their mass offer the most promising application. Typical objects of this description are metal cabinets, automobile bodies, lithographings on metal, and other coated flat stock. On the other hand, parts such as bicycle frames, mattress springs, and steel window frames, etc., would not appear to be well suited."

Definite Knowledge Still to be Acquired

According to patent No. 1,998,615, issued in 1935 to Frederick J. Groven, of Highland Park, Michigan, "It is not known definitely what causes the remarkable results obtained with this process. . . . It is believed that with the carbon filament bulb as a heating unit, wave lengths are projected, a large percentage of which penetrate almost through the layer of enamel so that surface heating is retarded while at the same time the penetration dries the enamel uniformly over its full depth."

We are told that radiant heating is as old as sunshine itself or the heat from an open fire. Radiant electric heaters have been on the market for a number of years and used extensively. Now, however, low-priced lamps are available which are adaptable to industrial use as a source of heat for a number of purposes. The details of application, however, must be developed for each use.

Best and most efficient results can only be obtained for any particular type of work by experimenting first on a small section. From results thus obtained, the needs for the entire installation must be computed. The factors involved include the nature of the material to be heated or dried, heat distribution, temperature control, number of lamps and the spacing of the lamps in connection with the distance from the product.

Pioneers in the use of this type of heating and drying have, in the main, been successful in solving certain problems confronting them. One large automobile manufacturer has found use for these lamps in drying priming coats of paint, first coat enamel, same finish enamel, and on all repair enamel jobs. Other types of heating operations involve the expanding of aluminum pistons under the lamps, to allow the pins to be slipped into place, and for the re-conditioning of electric motors. One electric motor manufacturer uses infra-red rays for baking motor windings. Special equipment is devised for the baking of the armatures of large motors. The installation is so planned that the armature can be turned during the baking operations so as to prevent dripping.

On a repair job it has been shown that many coats may be applied and dried so that the product may be used the same day. The refabrication of the fusilage of an airplane means two coats of filler for the fabric, one coat of aluminum paint, and something like twelve coats of lacquer. Such a job with air drying will require from two to five days, but with heat lamps one such job was done so quickly that the plane was ready for use the same day. Many more uses could be cited, some of which are outside the metal industry, and as experimentation goes on and is successful, the use of heat lamps may possibly be extended indefinitely.

Radiant energy travels in straight lines and at about the same speed as light. Shadows are therefore created with the invisible infra-red ray just as with light; and, as with light, this energy is reflected by some surfaces and absorbed by others. A dark-colored surface absorbs more than a light colored surface, and a rough surface more than a smooth or polished surface. In general, all substances and surfaces that are highly effective reflectors of light usually are effective reflectors of infra-red rays. Similarly, substances that absorb light usually absorb infra-red rays. When infra-red rays strike a polished surface they are reflected like light, while when they strike a mat reflector such as rough aluminum or porcelain enamel they are diffused; and, like light rays, they are bent as they pass through lenses or prisms. A perfect reflector does not become heated when infra-red rays strike it. Heat is developed only when the energy is absorbed.

Simplicity of Installation

Heating by radiant energy is largely independent of atmospheric condi-

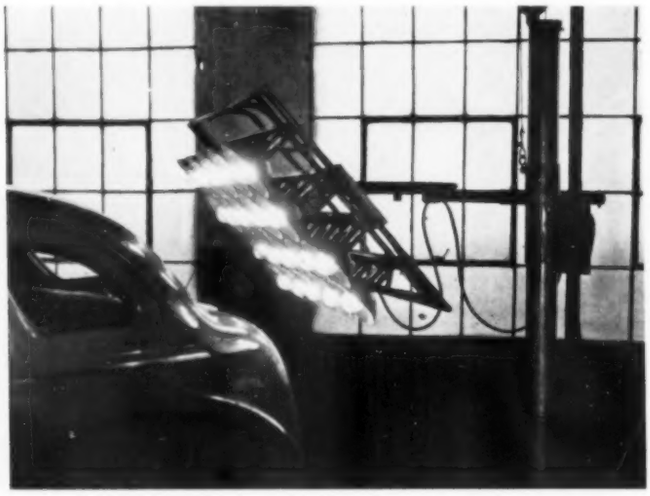

Fig. 3. A portable heat lamp unit being used in a paint touch-up department of an auto body plant.

tions. No movement of the air is necessary, thus reducing the dust hazard. And, unlike the conventional type of oven, no enclosure is necessary, since there is practically no heat loss due to the nature and speed with which radiant energy travels. In some instances, however, cylindrically shaped units have been insulated with asbestos or some such covering and used primarily to keep drafts or cold breezes off the product, as that would have a tendency to lower the temperature and affect results. Where the unit is enclosed, a small ventilator may be mounted on the top for the purpose of carrying off fumes.

There are, of course, various factors which must be kept in mind in designing the installation—such as distribution of heat, temperature control, number of lamps, spacing of the lamps with respect to the subject, nature of the material to be heated, and the type of lamp reflectors.

The temperature may be controlled by adjusting the speed of a conveyor which passes through a tunnel of lights or past a bank of lights; or by switching off certain lamps—alternate ones, for instance. Since the clusters of lights may be in portable units, the temperature on stationary objects may be controlled by varying the distance of the lamps from the work.

Other facts to be kept in mind: There is, for instance, the fact that the major part of the solvent in a paint film will evaporate spontaneously in a few minutes. Little will be gained by applying radiation while this solvent is evaporating. Then too, after having been subjected to heat treatment, forced cooling can be avoided if the conveyor is allowed to pass beyond the lamps. The baking will continue with the heat energy stored in the metal. This will also prove a source of economy.

Any standard socket which can be mounted on a metal frame may be used. The reflectors, however, are more important. They should have highly polished surfaces and be of a material that resists corrosion from gases and from the heat developed. Many of the reflectors now used are gold plated. Others are of polished aluminum and processed aluminum, each maker claiming certain advantages for his own product.

The reflectors in most cases are parabolic or spherical in shape. The parabola provides the necessary concentration when the work is carried through the heat zone on a conveyor. Thus conveyed there is little danger of spottiness, as all surfaces will be subjected to the same conditions. Spherical reflectors, according to experiments, will re-direct a larger percentage of the radiant energy for the given diameter. In practice, the lamps with their reflectors are mounted in banks, either arranged in parallel rows or in staggered form, close together with the lamps positioned anywhere from 12 to 24 inches from the work, depending on the product undergoing treatment, though there is no definite rule. Each type of work must be worked out by experimentation in order to arrive at the best results. Portable units are available which are exceedingly flexible in that they can easily be dismantled and formed into newly required arrangements, to meet varying drying problems. There seems to be a difference of opinion as to the preferred arrangement of the lamps, some advocating the staggered arrangement while others prefer equally parallel rows.

Like all industrial equipment, some maintenance is called for with this type of equipment. Escaping volatiles may fog the reflectors when certain types of work are done, temporarily reducing the efficiency. This film must be removed without causing any damage to the highly polished surfaces of the reflectors. The kind of cleaner to be used for this purpose depends upon the material from which the reflector is made. Each maker will give instructions as to the best method of cleaning his product. All abrasive cleaners should be avoided, as scouring will produce minute scratches (perhaps not visible to the eye, but nevertheless there) which would result in lowered efficiency of the reflector.

While the heat lamps have found many applications in industry, and particularly in the drying of organic finishes, this equipment nevertheless has certain limitations which have not yet been overcome. Constituents in the coating material will definitely affect results. Pigments that hold their density are good, but vegetable toners may cause trouble. Synthetic enamels, lacquers, and synthetic lacquers apparently are best suited for the present type of heat lamp. Some colors require less heat than others. Likewise, brightly polished surfaces absorb less heat than do mat or rough surfaces.

Formerly, with the so-called high-bake synthetic enamels, results were not so good. Now, with a different type of heating equipment it is believed that it will be possible to bake almost any kind of synthetic enamel. Oil paints and oleo-resinous enamels require more time because of the considerable oxidation which takes place. The consensus of opinion is, however, that for certain types of work, efficiency can be stepped up, costs can be cut, and time may be saved by means of infra-red heating equipment.

EDITOR'S NOTE: For helpful data as well as for the loan of pictures used in illustrating this article we acknowledge the courtesy of the following manufacturers:

The Fostoria Pressed Steel Corporation, Fostoria, Ohio,
The Edwin F. Guth Co., St. Louis, Missouri,
North American Electric Lamp Co., St. Louis, Missouri.

Air Cleaners for Clean Spraying of Organic Finishing Materials

By L. F. Johnston
Chicago, Illinois

Quality spraying demands a clean and constant supply of air. The various commercial air filters and separators for paint spraying systems are described. —Ed.

The delivery of clean, dry air in any spray painting operation must be looked upon as being as important as is the delivery of the required pressure and the exactly desired shade and consistency of paint, enamel, lacquer, or other coating. Likewise in the spraying of dry materials such as lubricating powders, chalk, ground cork, or cotton and rayon flock, great care must be taken that all moisture and oil vapor be eliminated from the compressed air supply.

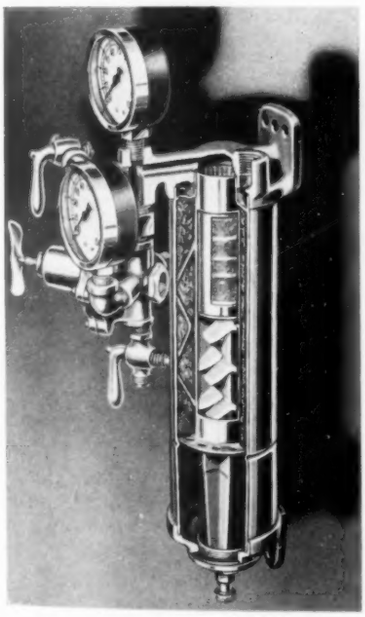

Fig. 1. Cut-away view showing copper shavings, baffle plates, and filter pads.

Water, resulting from the condensation of the moisture of the atmospheric air in the airline, and the oil vapor caused by the heat of compression vaporizing lubricating oil passing by the pistons in the compressor cylinder, must be trapped and disposed of. Unless the air compressor is equipped with a satisfactory filter on the inlet connection, dust in the air will pass through the compressor into the air line and this dust, together with other particles of foreign matter will constitute a decided hazard in the production of high quality finishes. Blushing, spotty finish, and off-color shades may result, together with a possible clogging of the delicate mechanism of the spray gun or airbrush. But it is not only paint spraying which suffers from inefficient air-conditioning. Experience has shown that air hammers, drills, riveters, and other air tools wear out and grind to pieces prematurely from the use of unclean air.

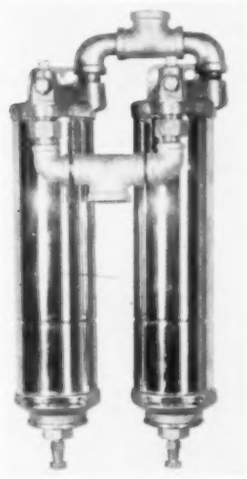

Fig. 2. In those instances where more than 25 cu.ft. of air must be handled, a combination of standard single units in multiples of 2, 3 or even 4 may be installed.

Mechanical Air Cleaners

To meet this demand for clean air, particularly in spray painting, and to insure the elimination of oil and water as well as particles of dirt so frequently present in compressed air supply lines, the installation of mechanical filtering devices has been found essential. These air-conditioning units are of differing designs and are referred to by a variety of names, such as extractors, transformers, separators, or purifiers. Most manufacturers make several styles, some without gauges for certain types of work, others with one gauge to indicate the regulated air pressure at the outlets, and still others with two gauges, one showing the main line air pressure and the other the regulated pressure of clean air.

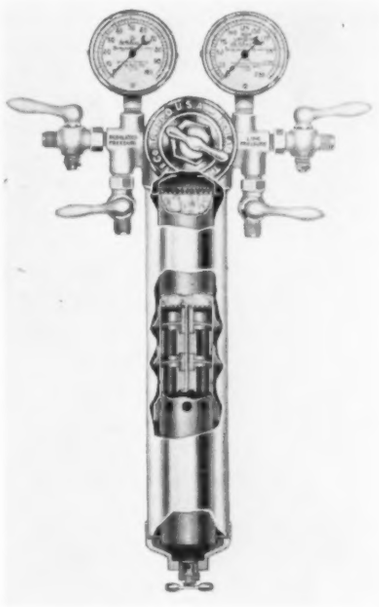

Fig. 3. Cut-away view of transformer showing arrangement of baffles and replaceable cotton waste filler.

The principle of filtration is similar in most of the makes of units with, however, some variations as to design

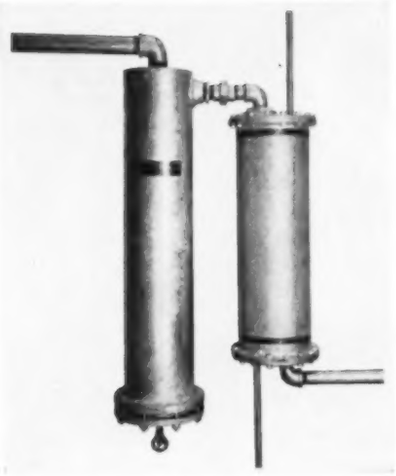

Fig. 4. A pre-cooler for installation ahead of the main line extractor.

and working details. Some units are constructed for light or intermittent service; others for heavy duty. The vertical tube style appears to be the standard type of exterior with all manufacturers of air filter or condenser units, the chief variations being in the inner mechanism controlling the filtration of the air as it passes through the unit. This is accomplished either by a series of baffle plates, filter pads of cotton waste or other absorbent product, chemical purifiers, or a series of fine galvanized mesh wire walls, or of a combination of two or more of these.

The units are so designed that the flow of air from the compressor enters at the top of the chamber, passing downward through the filtering mechanism, then upward through an inner tube, after which it is discharged into the air line leading to the spray gun.

In the operation of the oil and water extractor marketed by one manufacturer, the air, after entering the unit through the inlet at the top, travels downward just inside the outer shell, passing through a maze of copper shavings where the air is cooled and any dust or foreign particles are removed. Three-fourths of the way down, the air passes through a perforated disk to enter a settling chamber where moisture and solids are deposited. Making a sharp turn, the air reverses its course, passing upward over a series of cold baffle plates in the center of the extractor, and then through five felt filter pads which extract the last vestige of dirt, moisture, or oil before the air is permitted to leave the unit.

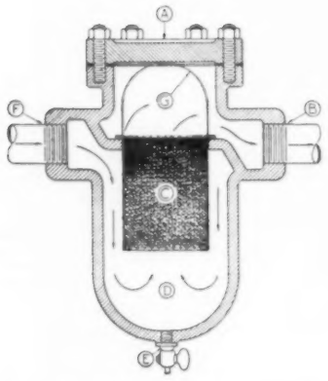

Fig. 5. Diagram showing passage of air through pipe line filter. Air enters at "F" flowing into expansion chamber "D" where portion of oil, water and dust is removed by centrifugal action; after which air is diverted upward through the filter cartridge "C" of crimped wire where any remaining foreign matter is removed, the clean air passing out at "B". Accumulated oil and moisture is drained through the petcock "E", while the filter cartridge may be serviced by removing the top cover "A".

Other filtration units of different make are somewhat similar in operation. In one, as the air enters the transformer it is directed through a fine-mesh cylindrical screen, which stops any dirt, grit, or scale. This screen is easily removed for cleaning. Having passed the screen, the air passes through the regulator and expands in the condensing chamber, condensing a large percentage of the moisture, which, together with the oil, is automatically separated from the air stream. In its course through this transformer, the air passes through four separate and individual tubes or chambers, providing a large cooling surface in which condensation may take place. The last traces of water and oil are removed by a cotton waste filter through which the air passes just before entering the outlet leading to the main air line.

This company has recently put on the market a transformer of new design. It is claimed that it handles in excess of 50 cubic feet of air per minute with a minimum pressure drop; that it will pass sufficient air for two production spray guns in continuous and simultaneous operation, or for three in ordinary intermittent use. The filtering process is accomplished by means of a charge condensing chamber, a new arrangement of the baffles, and a unique mechanical metal filter which does away with the necessity of removing and replacing of waste packs.

One other air cleaner on the market operates on an entirely different principle from the others. It is definitely not a filter, and as a separator it is in a class of its own. It is a mechanical cleaner operated on the centrifugal principle for the separation and removal of water, oil, and other foreign matter from compressed air.

The unit consists of a rugged bell-shaped casing, with an inlet at the lower end and an outlet at the upper end, enclosing a series of rotors, having inclined vanes and openings through which the air may pass; and mounted so that they are free to revolve on stainless steel ball bearings.

The vanes are arranged similar to those of a windmill, and each alternate rotor has its vanes inclined in the opposite direction, causing some of the rotors to revolve in one direction while their adjacent rotors revolve in the other direction, thus preventing the air stream from developing a swirling action. As the air stream passes through, the moisture and other foreign matter are forced against the vanes of the rapidly revolving rotors, and are thrown outward by centrifugal force against the inner walls of the casing, moving down by gravity to the lower part of the device, from there to be removed through a valve or a trap.

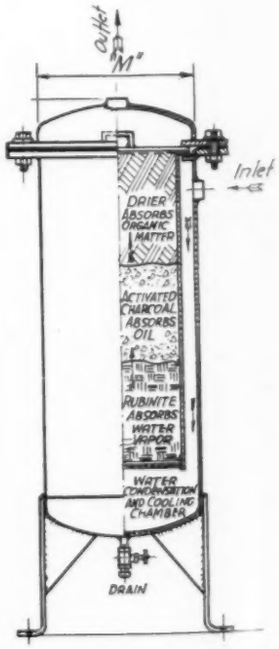

Fig. 6. Descriptive drawing of mechanical and chemical air purifier.

Fig. 7. Moisture and oil separator for air and gas lines.

Different Sizes for Specific Types of Work

Air cleaning units vary in size according to capacity requirements, some heavy duty units being quite large. One manufacturer produces an "extra heavy duty condenser" that is 4 ft. 8 in. long with a tube diameter of 6 in., while another manufacturer produces a heavy duty extractor 45½ in. high with an overall diameter of 8¾ in., capable of handling 200 cu. ft. of air per minute. Still another manufacturer produces "compressed air purifiers, the units ranging in cylinder heights from 14 in. to 48 in. and weighing from 22 pounds to 160 pounds." In the latter, the cleaning process is carried on both mechanically and chemically, the filtering compound being entirely separate from the water condensation chamber. This eliminates the frequent renewals of the compounds, since, under ordinary working conditions a single charge will serve for several months. As the air enters the unit, it passes downward through the condensation and cooling chamber, then upward through the chemical purifier; first through rubinate which absorbs any water vapor, then through activated charcoal where any oil is absorbed which may be present, and finally through a drier, absorbing any organic matter.

Provision for the Removal of Foreign Matter

Accumulations of the extracted oil, water, and solids must necessarily be removed from the unit. Cleanliness is important, since otherwise foreign matter might be picked up by the air in its passage through the filter unit and be carried into the air line and deposited on the finished work. To simplify the removal of this waste accumulation, the units are fitted with a valve or pet cock at the lower end of the chamber.

Some units are equipped with automatic drains, carrying the protection of the finished work to the highest point of efficiency in the automatic removal of water, oil, and dirt from the air supply line. The automatic drain prevents water and oil from accumulating in the lower portion of the unit. Operated by volumetric pressure it is positive in its action. Whenever an excess of water and oil collects in the small catch basin, or settling chamber, at the lower end of the unit, a float rises and opens a valve, keeping it open until the excess is drained off.

Maintenance of Air Cleaning Units

Like any other piece of industrial equipment, filtration units demand some care and attention to keep them functioning properly. Those not equipped with automatic drains must be emptied each day or more frequently if necessary. The filtering medium also must be changed from time to time. The accompanying service chart gives the symptoms of some of the commoner difficulties encountered in the operation of air filters, together with the usual cause of each, also the remedies for these difficulties.

Service Chart

Trouble	Cause	Remedy
Air leak from small hole in regulator cap.	Improperly seated or broken diaphragm.	Remove and reseat or replace regulator diaphragm.
Insufficient removal of moisture from air.	Moisture filled transformer.	Drain transformer.
	Moisture saturated waste.	Replace with dry waste.
Excessive air pressure drop when spray gun trigger is pulled.	Too many spray guns or other items of equipment in simultaneous operation.	Shut off all equipment but spray gun and note air pressure drop on gauge.
	Obstructed air passages.	Inspect for dirty, hardened waste. Remove air regulator valve and inspect valve seat. Seat should be flush with its container edge.
	Dirty waste.	Replace with clean waste.
Gradual building up of pressure on pressure gauge after adjustment.	Improper seating of air regulator valve seat due to dirt accumulation on seat.	Remove regulator body cap and tap sharply on end of regulator valve. If this does not remedy condition, remove valve and clean valve seat.

EDITOR'S NOTE: For supplying pictures and helpful data for use in this article we gratefully acknowledge the courtesy of the following manufacturing companies:
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E. D. Bullard Company, San Francisco, California,
The DeVilbiss Company, Toledo, Ohio,
Logan Engineering Co., Chicago, Illinois,
Paasche Airbrush Company, Chicago, Illinois,
Spray Engineering Company, Somerville, Massachusetts.

Moisture Peeling of House Paints*

EFFECT OF STRUCTURAL DETAILS

J. W. Iliff and R. B. Davis

E. I. du Pont de Nemours & Company, Inc., Philadelphia, Penna.

The complete insulation against internal moisture did not allow the accumulation of moisture under the paint film. Thus no paint failure occurred. Similar results were obtained simply by plugging the holes in the galvanized iron sheets.

The effect of this type of seal on moisture due to leaks will, in all probability, be little or nothing if it is located as shown and especially if it is located close to the lath. Otherwise the reduction in the vapor capacity of the air space might cause an increase in trouble probabilities. If, however, it is placed between the sheathing and the siding, adverse effects, similar to those obtained from tar paper but exaggerated as to degree, may reasonably be expected.

In general, therefore, the proper location of the moisture-insulating layer should preferably be within the side wall and immediately back of the lath.

Blocking of Internal Air Circulation

Field observations have shown that the tightening of the construction of side walls to conserve fuel and to improve comfort has resulted in a greater frequency of moisture failure. Consequently it may be assumed that anything which seriously reduces the circulation of air within the side walls will also have an adverse effect on moisture failure. To do this would prevent any residual dry air from becoming effective as a desiccating agent for the affected areas.

This is the concluding portion of the article which appeared in the Organic Finishing section of the April issue of Metal Industry.

In order to verify this theory, two sections of wall space were set up (Figure 12). Wallboard was used for the interior surface to make uniform the penetration of moisture over the entire surface. The exterior surface was built up in the ordinary manner. A very small amount of external air was introduced into the wall space through tiny slots located at the top and bottom of the test sections. In one space the air circulation was blocked through the use of a porous material; this prevented the free circulation of the air and left tiny pockets of stagnant air within the walls. The control section was identical in construction but no blocking material was introduced.

The results of this test are shown in Figure 13. The section of wall in which the air circulation was blocked permitted the accumulation and condensation of moisture on the external surface with consequent paint failure. However, the controls throughout the test period failed to accumulate enough moisture to be measured, and the paint remained intact.

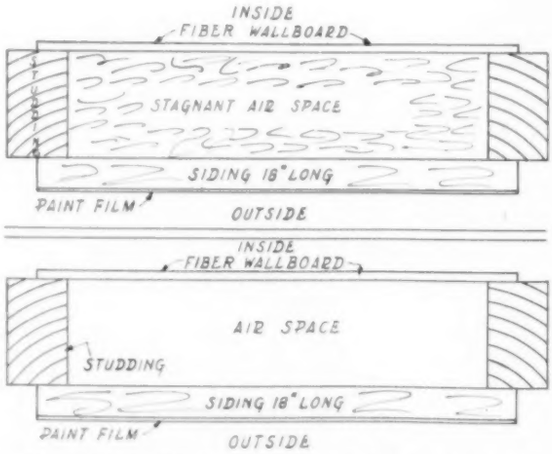


Figure 12. Blocking of internal air circulation.

If the moisture should enter through a leak, it is probable that the blocking of air circulation would have a similar adverse effect. It would also prevent the evaporation of this moisture and its removal into the dry exterior air.

Effect of Exterior Air Just behind Painted Areas

Reduction in the circulation of air in side walls often causes increased moisture failure of the exterior paint. Conversely, we would expect the deliberate introduction of external air to reduce failure. For this to be practical it must be done so as not to interfere seriously with the heat-insulating properties of the wall itself. Moreover, the wall must maintain its water-shedding characteristics.

Such a method of construction was suggested a number of years ago by F. L. Browne of the Forest Products Laboratory. Figure 14 is a representation of this method. The usual wall construction is followed except that the siding is not attached directly to the sheathing-tar paper layer. It is raised from this surface a fraction of an inch through the use of furring strips. In addition, a tiny amount of exterior air circulation is introduced into this thin air space by slightly separating every tenth piece of siding from the one immediately below it. This was accomplished through the use of thin strips of wood about 1/16

inch thick. Tests with this type of construction yielded the results illustrated in Figure 15. This method was completely effective, even under the severe conditions of the present test.

In carrying out the above test, two methods of construction were used—i.e., with and without tar paper. The one illustrated was without the tar paper (the more severe of the two tests). Similar results were obtained in the test with tar paper.

It is reasonable to expect that moisture from leaks would also be largely removed by the same means.

Obviously the thickness of this air space is an important factor in its effectiveness. A minimum is desirable to maintain the heat-insulating properties of the wall. On the other hand, a minimum is necessary to effect the required ventilation and to ensure agaist closing of the space through swelling of the wall members. The thickness used here was ¼ inch. The closeness of this thickness to the optimum has not yet been determined.

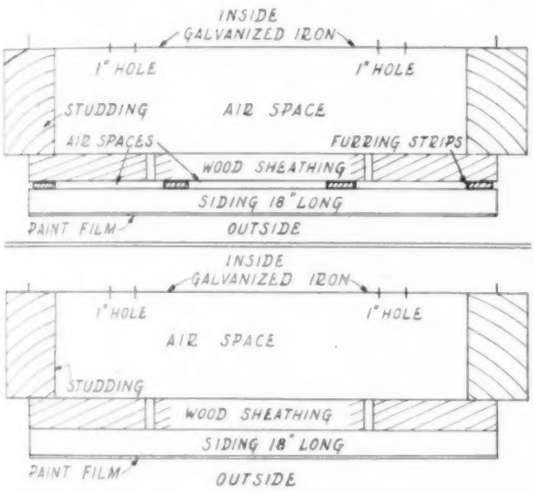


Figure 14. Effect of exterior air behind painted areas.

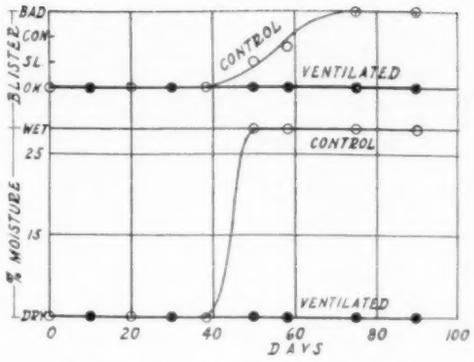


Figure 13. Results of tests with stagnant air space.

Ths type of construction will reduce to some extent the heat-insulating properties of the wall. The extent of this reduction would be appreciable if none of the modern insulating materials were used. However, it is probable that with adequate insulation its increment would be negligible.

The inferences and suggestions made in this paper should not be considered as final solutions to this problem. They are offered rather as a few of the leads which, if followed, may result in some rationalization of wall construction in so far as it affects exterior paint failure.

Perhaps one of the basic weaknesses of modern house construction is that "improvements" have been made without proper regard to the effect of these changes on exterior paint performance. It is suggested, therefore, that the attention of both the paint and building industries be focused more closely in this direction.

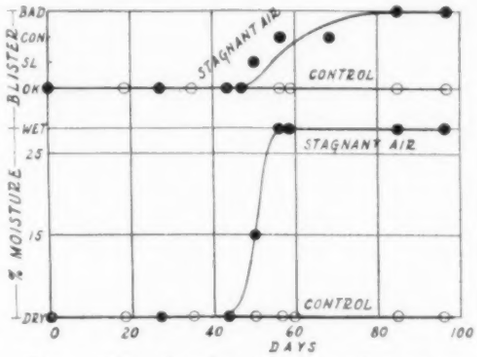


Figure 15. Results of tests with furring strip ventilation.

Literature Cited

(1) Gardner, H. A., Natl. Paint, Varnish Lacquer Assoc., Sci. Sect., *Circ.* 317, 480 (1927).

(2) Hartwig, O. R., *Ibid.*, 355, 742 (1929).

PRESENTED before the Division of Paint and Varnish Chemistry at the 97th Meeting of the American Chemical Society, Baltimore, Md.

ORGANIC FINISHING DIGEST

PATENT AND LITERATURE REVIEWS

EVALUATION OF NITROCELLULOSE SOLVENTS — Industrial & Engineering Chem. April, 1940, 519-524. V. W. Ware and W. M. Bruner: Little attention has been given alcohols as nitrocellulose solvent diluents. By the method of constant viscosity, a complete picture is obtained of the "coupling action" of alcohols on esters. The esters whose solvent properties are improved by alcohols, the alcohols which cause this improvement, and the extent to which it is applicable, is defined. Eight esters were compared in the reaction of their solvent strength to dilution with each of eight alcohols. The possibility of establishing a new lacquer-solvent balance in which the present hydrocarbon diluent is reduced to a minimum to obtain resin and oil compatibility, is pointed out.

VISCOSITY VARIATIONS IN METHACRYLIC ESTER POLYMER SOLUTIONS —D. E. Straer, Ind. & Eng. Chem. April, 1940, 540-541: Tests were made of various solvents on the viscosity of methacrylate ester solutions. Toluene seems to give the lowest viscosity. Toluene seems to be the most active solvent for methacrylic ester polymers but much lower viscosities can be obtained at the same solids content by using toluene-alcohol mixtures as the solvent.

REMOVING AGENTS FOR LACQUER COATINGS. Freitag. Oberflaechentech. 16, 222, (1939): The removal of lacquers with the commonly employed turpentine, benzine or alkalies is frequently costly and requires time and mechanical scraping. The writer suggests a new agent for this job: methylene chloride. Paraffin is dissolved in this solvent to retard evaporation, and a thickener is added so that the too liquid solution will not run off the job to be stripped of lacquer, e.g., methyl cellulose dissolved in ethyl alcohol or methanol. The advantages of such a lacquer remover are that it adheres even on vertical surfaces, is not inflammable and acts quickly, the layers softened by it can be readily removed and the surface is easily cleaned again for a fresh coat of lacquer. Dichloroethyl ether is also a good remover of lacquer and does not need paraffin as an addition as it does not evaporate so readily and has a high ignition point, 131°. When mixed with alcohol, it can also be used as a solvent for cellulose esters.

MEASUREMENT OF CORROSION RESISTANCE OF IRON UNDER VARNISH AND PAINT FILMS BY THE METHOD OF ELECTRODE POTENTIALS. A. M. Lazarev and E. V. Iskra. Trudy Inst. Lakov i Krasok 2, 191-207 (1939): The resistance to corrosion of iron rods covered with two layers of protecting agents was measured. The agents used were zinc oxide, lithopone, iron oxide, green lead, lead chromate, ocher and naphthenates (all in natural drying oil). Different corroding electrolytes were tried such as chlorides, phosphoric acid, etc. Corrosion was found to be greater in a flowing electrolyte than in a stationary one.

NEW METHOD FOR DETERMINING THE ADHERENCE OF VARNISH AND PAINT FILMS. S. V. Yakubovich and E. V. Iskra. Trudy Inst. Lakov i Krasok, 2, 156-67 (1939): A strip of paint film is removed by means of a sloping knife. This permits the obtaining of a quantitative characteristic of the adhesion of the varnish film to the surface of any material. The adhesiometer produces results which can be duplicated. The adhesion can be characterized by the effort needed to remove the film from a unit of surface. The writers deduce various formulas.

THE SHRINKING OF VARNISH AND PAINT FILMS. S. V. Yakubovich and E. V. Iskra. Trudy Inst. Lakov i Krasok, 2, 149-56, (1939): The writers measured the shrinkage of varnish and paint films after drying with a special apparatus after the paint or varnish film was removed from the carrying surface. Films of artists oil paints and nitro films have a very long shrinkage period after drying. The amount of shrinkage depends on the material and composition of the films. In oil paints, a maximum shrinkage was observed for a definite amount of oil.

WATER MISCIBLE EMULSIONS OF PAINTS AND LACQUERS. K. Popov Masloboino Thirovoe Delo 15, #5, 28-30 (1939): Preliminary experiments were made in the preparation of oil-in-water paints. The paints were prepared from dehydrated castor oil and sardine oil boiled with a 10% manganese-calcium dryer. The best product was obtained with: oil, 33.41%; lithopone, 39.8%; dry casein, 3.31%; phenol, 0.06-1.5%; and NH_4OH, 23.41%. The paints when diluted with water can be brushed but not sprayed. The coatings dry in 48 hours. In hardness, elasticity and resistance to water these paints are inferior to those formed with common oils.

EFFECT OF CLEANING METHODS ON THE STABILITY OF THE VARNISH FILM. S. V. Yakubovich and E. V. Iskra. Trudy Inst. Lakov i Krasok, 2, 114-40 (1939): The chemical methods of cleaning facilitate the corrosion of surfaces which have been subsequently covered with varnish films. The corrosion sets in with the appearance of small centers that destroy the paint, thereby creating conditions which favor a rapid spread of the corrosion. Mechanical cleaning with brushes is considered by these writers to be the best cleaning method. Experiments are described and photomicrographs given.

REAGENT RESISTANCE TESTS ON FINISHES. G. G. Seward and H. S. Klund. Natl. Paint, Varnish, Lacquer Assoc. Sci. Sect. Circ. 570, 7-13 (1939): Film coatings were examined for their resistance to various reagents. The reagents used were: lemon juice, 50% alcohol, whisky, whisky of highball strength, beer, 3% caustic soda, 50% hydrochloric acid and toluene. The reagent was applied as a paste mixed with barium sulphate. Reduction in the gloss of the finish was taken as a measure of chemical attack or deterioration, after standing a given period of time in contact with the reagent. The resistance to the HCl was best in reduced phenolics and alkyds and was improved on baking. Resistance to caustic soda was best in straight phenolics and in tung oil-V-resin varnish. Air dried finishes and baked alkyds were badly affected. Lemon juice and beer had practically no effect. Baked alkyds resisted toluene and baked natural resin varnishes resisted alcoholic beverages.

GELATION RATES OF TUNG AND OCTICICA OILS. D. Cannegeiter. Paint, Varnish Production Mfgr. 19, 366-8 (1939): Gelation times are given for the two oils for certain temperatures between 261° and 359°. A minimum occurs at approximately 350° for tung oil and approximately 295° for octicica oil. An increase in the acid number increases the gelation time. Decomposition of the tung oil starts at 250° and for the octicica oil starts at 295°.

SEMIDRYING OILS IN THE MANUFACTURE OF DRYING OILS AND LACQUERS. A. A. Ivanova, Trudy Inst. Lakov i Krasok 2, 236-51 (1939): 30% corn oil, 20% rape seed oil, 10% mustard seed oil or 20% cottonseed oil can be combined with linseed oil to give mixtures of the same drying speeds as those of natural drying oils. The hardness, elasticity, water resistance and heat stability are satisfactory. Drying oils prepared from polymerized oil mixtures dry more slowly than the unpolymerized oil mixtures while a drying oil composed of a mixture of oils which were individually polymerized, dries even more slowly. The heat resistance is higher with the unpolymerized oils and the polymerized oils are more water stable and coagulate more rapidly. A number of experiments are described.

NEW EQUIPMENT AND SUPPLIES

LATEST COMMERCIAL DEVELOPMENTS IN ORGANIC FINISHING

Flock Gun

The Electric Sprayit Co., Sheboygan, Wisc., announces a new gun for applying flock.

The flock is made from finely cut rayon, cotton or wool, and is used to produce a velour or suede-like finish. It is sprayed on after a coat of sizing material has been applied to the surface, while the sizing is still sticky.

Flock Gun

The model FL flock gun is light in weight being made of an aluminum alloy and has a comfortable revolver grip handle. All controls are located at the back of the gun and the full range of adjustments including changing from a round to a fan spray are achieved without adjusting the nozzle, and permit the easy application of any grade or quality of flock, glow beads or other types of powders.

An oil and moisture filter is included in the handle of the gun obviating any difficulty from dampening of the flock.

The spray gun may be had with a one quart glass jar, a two quart glass jar or a one quart aluminum container.

Emergency Fire Suit

Industrial Products Co., 745 W. Somerset St., Philadelphia, Pa., have announced the development of a fire suit to provide complete body protection. The suit can be put on very rapidly.

The free swing raglan shoulder jumper suit with overshoes attached is made from Underwriters' grade asbestos cloth, and is automatically adjustable at waist for any normal size; also at ankles to take care of varying leg lengths. There is an extra long asbestos tab on the protected full length zipper to insure quick closing. All raw edges are bound to prevent raveling. The overshoes are lined and have steel studded chrome leather soles with asbestos inner soles. This outfit will, it is pointed out, allow full and comfortable fire-fighting freedom.

Emergency Fire Suit

The helmet is made from the same grade asbestos cloth and fully lined. Glare-proof brass screen covering a mica lens affords safe and full vision.

The outfit is completed by asbestos gloves, full cut, lined and leather reinforced.

Propeller Type Agitators

The Binks Manufacturing Company, 3114-40 Carroll Avenue, Chicago, has just announced the production of a complete line of Propeller Type Air Motor Drive Agitators for both Open and Closed Type Containers.

The No. 939 Series for Open Type Containers consists of two airplane type propellers, one pitched right and the other pitched left, so that they "throw" towards each other, insuring more perfect mixture and the prevention of splashing.

These agitators, being driven by an air motor, are said to be ideal for any sort of liquids where there is an explosion hazard.

Propeller Type Agitator

The shafts can be furnished from 12″ to 27″ long. Adjustable clamps enable the operator to fasten the agitator to the outside of a barrel in any desired position.

The No. 636 Series, consisting of an agitator drive, is for closed type barrels which have their own agitating mechanism. The unit is furnished with 3 adapters for all usual openings.

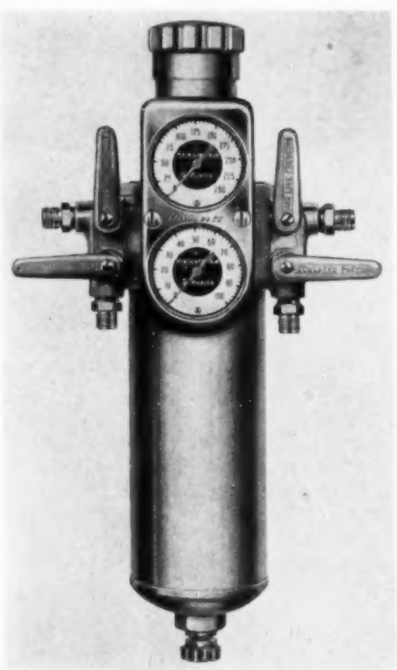
Complete details and prices may be secured from the above mentioned manufacturer on request.

Air Transformer

The DeVilbiss Co., Toledo, Ohio, have just announced a new air transformer called type HLC, for spray painting processes.

The equipment is said to have improved filtering facilities, more sensitive regulation and control of pressure for feeding of clean moisture-free air to the spray gun. The equipment handles an excess of 50 cu. ft. of air per minute with a minimum of pressure drop. It will pass ample air for two production spray guns in continuous and simultaneous operation or for three spray guns in ordinary, intermittent production use.

Constructional features include a large synthetic rubber regulator diaphragm, re-



Air Transformer

fined operating mechanism, and a large conveniently located regulator knob, resulting in a fine degree of sensitivity in pressure regulation. The large testing chamber offers greater air expansion and more thorough condensation of moisture. New baffling and filtering constructions are used.

New Portable Electric Sander

The Syracuse Guild Tool Co., Syracuse, N. Y., announce the addition to their line of a new portable electric sander, using standard 3-inch by 24-inch abrasive belts. With a belt speed of 1350 ft. per minute, it is said this tool speeds up sanding and surfacing operations on wood, metal, marble, slate, plastics, and other composition materials.

Equipped with a ½ H.P. Universal motor, it operates on any 110 volt AC or DC line, or can be supplied for other voltage requirements.

This Guild Sander, Type G-3 is balanced, compactly built and easy to handle. All moving parts, including the drive and idler pulleys, are equipped with precision ball bearings. Its patented belt aligning control insures, according to the company, perfect belt traction regardless of motion used. Another patented feature is its quick belt change latch that cannot stick.

Portable Electric Sander

Light in weight (only 15 lbs.) this new sander, the manufacturer reports, is a time-saver on both bench and holding jobs. It is said to be equally efficient on new work or removing old finishes, interior or exterior. The frame is sturdily cast of tough aluminum alloy and has a highly polished, mirror-like finish. The manufacturer will gladly send complete details on request.

Small Spray Painting Outfits

A new series of small spray painting outfits known as the NCB, featuring streamlined designs, has been announced by the DeVilbiss Co., Toledo, Ohio.

The line consists of five different spray equipment assemblies, the units all containing a new and different ¼ H.P. electric motor driven air compressing unit. Three are cup gun outfits and two include a pressure feed paint tank of two-gallon capacity. The air compressing unit consists of a ball bearing, piston type compressor, directly connected to a standard ¼ H.P. motor. These, together with the air strainer, crankcase and pulsation chamber, form an integral unit.

Rated displacement is 4.3 cu. ft. of air per minute at 40 pounds pressure. Actual air delivered at this pressure is 2.6 C.F.M.; maximum pressure 50 pounds. The unit is said to be sturdy in construction but compact and light of weight, and is provided with four rubber feet.

These new outfits are being stocked by all DeVilbiss distributors where they will be displayed and demonstrated.

Detective Work on Metal Finishes

By V. M. Darsey

Technical Director, Parker Rust-Proof Co., Detroit, Mich.

In many instances where premature failures of paint finishes occur, it can be traced to the presence of some activator on the surface of the metal prior to painting. The presence of hand marks, dirty rag marks, chalk marks, rinse streaks, water and alkali spots, to mention only a few of such conditions, is sufficiently active to account for many such paint failures. The detection and avoidance of such conditions on the surface of objects prior to painting is a primary requisite in any successful paint procedure.

Since some of these activators are invisible, advantage is taken of their property when in contact with moisture to form blisters in the paint film at the contaminated areas for their detection. Exposing painted articles inside a cabinet at 100° to 110°F. with 96 to 100 per cent relative humidity,

*From A.S.T.M. Bulletin January 1940.

or immersing them in water at this temperature, is used as an accelerated test for detecting such conditions. The nature and characteristics of the blistered area (see Figs. 1 and 2) in the paint film are generally sufficient evidence to determine the source of the contaminating factor. Once the cause is ascertained, it can be immediately remedied with the result that the producer avoids any finished articles getting into service which might fail prematurely and thus avoids expensive refinishing charges.

Fig. 1. Ordinary white chalk on plain steel surface.

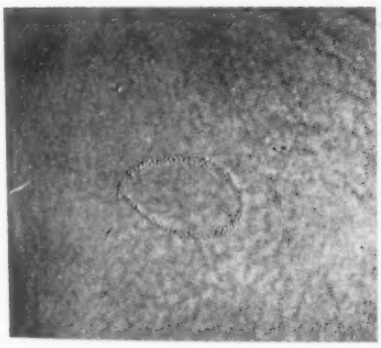


Fig. 2. After applying the paint over the entire panel containing the chalk mark, and subjecting the panel to humidity tests, pronounced blistering is observed at the area containing the chalk mark.

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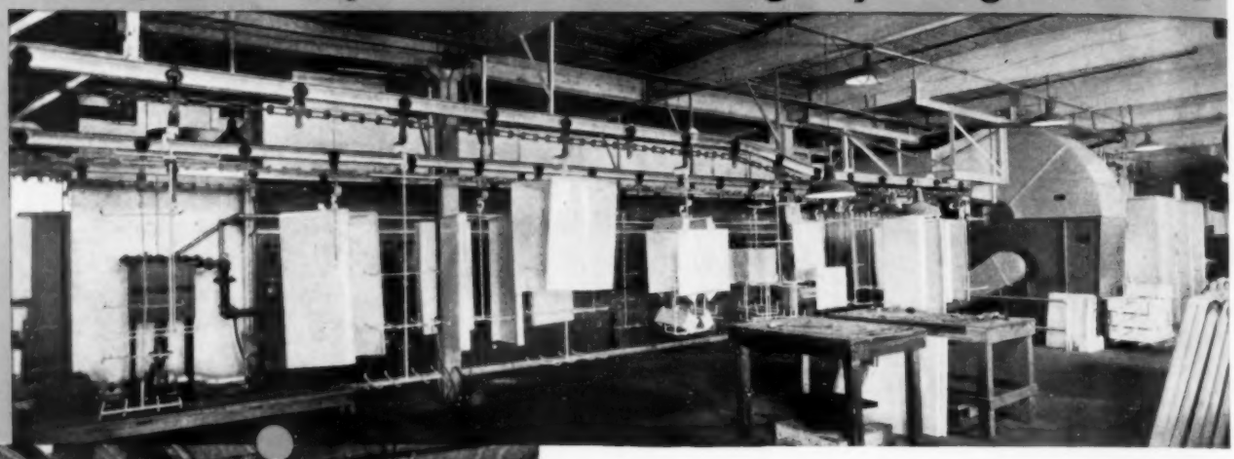

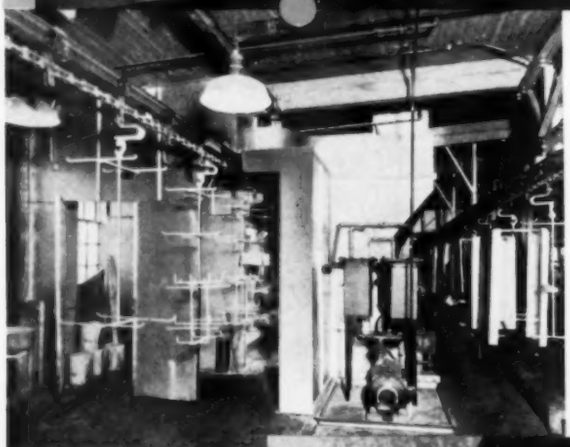

The top illustration shows one of two complete units designed and installed by Mahon for the Gibson Refrigerator Company, Greenville, Michigan. The illustrations above show the entrance to a Mahon Down-Draught Hydro-Filter Spray Booth—part of the same installation. This Finishing System was designed for the application of Synthetic Enamel and has been in operation for approximately two years.

Above: Interior of a Mahon Down-Draught Hydro-Filter Spray Booth showing filtered air supply.

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